

ISSUED FOR BID

WTA ARCHITECTS



New structure and facility for :
Port Austin Four Seasons Pavilion

ARCHITECT'S PROJECT NO. 20210120

WTAARCH.COM



SECTION 00 0100

PROJECT DIRECTORY

PROJECT: Village of Port Austin
Port Austin Four Seasons Pavilion

PROJECT LOCATION: Village of Port Austin
17 West State Street
Port Austin, MI 48467

CONSTRUCTION MANAGER: R.C. Hendrick & Son, Inc.
2885 S. Graham Road
Saginaw, MI 48609

ARCHITECT: WTA Architects
100 S. Jefferson Ave., Ste. 601
Saginaw, MI 48601

MECHANICAL / ELECTRICAL MacMillan Associates, Inc.
714 E Midland St
Bay City, MI 48706

ICE RINK CONSULTANT: Serv-Ice Refridgeration
143 Cady Center 207
Northville, MI 48167

END OF SECTION 00 0100

SECTION 00 0110

TABLE OF CONTENTS

DIVISION 0	BIDDING AND CONTRACT REQUIREMENTS
00 0100	PROJECT DIRECTORY
00 0110	TABLE OF CONTENTS
00 0115	LIST OF DRAWING SHEETS
00 1000	ADVERTISEMENT FOR BID
00 2000	INSTRUCTIONS TO BIDDERS
00 2200	BID CATEGORY GENERAL NOTES
00 2400	BID CATEGORY DESCRIPTIONS
00 3100	INFORMATION AVAILABLE TO BIDDERS
00 3113	MILESTONE SCHEDULE
00 3146	PERMITS
00 4000	BID FORM
00 5000	AVAILABILITY OF ELECTRONIC FILES
00 5001	CONTRACT / AGREEMENT FORM
00 6100	BONDS
00 7200	GENERAL CONDITIONS OF THE CONTRACT
00 7300	SUPPLEMENTARY CONDITIONS
00 7316	INSURANCE REQUIREMENTS
00 8100	SAFETY REQUIREMENTS
DIVISION 1	GENERAL REQUIREMENTS
01 1100	SUMMARY
01 2100	ALLOWANCES
01 2200	UNIT PRICES
01 2300	ALTERNATES
01 2600	CONTRACT MODIFICATION PROCEDURES
01 2900	PAYMENT APPLICATION PROCEDURES
01 2976	SWORN STATEMENTS AND WAIVERS
01 3100	COORDINATION
01 3119	PROJECT MEETINGS
01 3300	SUBMITTAL PROCEDURES
01 4000	QUALITY REQUIREMENTS
01 4516.01	CONCRETE TESTING
01 4516.02	DENSITY AND AGGREGATE TESTING
01 5000	TEMPORARY FACILITIES AND CONTROLS
01 5726	DUST CONTROL
01 6000	PRODUCT REQUIREMENTS
01 7123.16	CONSTRUCTION STAKING BY CONTRACTOR
01 7329	CUTTING AND PATCHING
01 7400	CLEANING AND DEBRIS CONTROL
01 7450	CLEANUP AND RESTORATION
01 7700	PROJECT CLOSEOUT PROCEDURES
01 7836	WARRANTIES

APPENDIX	MEDC BIDDING AND CONTRACT REQUIREMENTS
004L	CONTRACT SPECIAL PROVISIONS
004N	PERFORMANCE BOND
004O	PAYMENT BOND
004R	FEDERAL LABOR STANDARDS PROVISIONS
	CURRENT DAVIS BACON RATES
004S	PROJECT SITE POSTER
004T	CONTRACTORS PACKET
004F	MITIGATION MEASURES
DIVISION 02	EXISTING CONDITIONS
02 4113.13	PAVEMENT REMOVAL
DIVISION 03	CONCRETE
03 3000	CAST-IN-PLACE CONCRETE
DIVISION 04	MASONRY
04 2000	UNIT MASONRY
04 4316.16	ADHERED STONE MASONRY
04 7200	CAST STONE MASONRY
DIVISION 05	METALS
05 5000	METAL FABRICATIONS
DIVISION 06	WOOD, PLASTICS, AND COMPOSITES
06 4116	PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS
DIVISION 07	THERMAL AND MOISTURE PROTECTION
07 2430	EXTERIOR FINISH SYSTEM FOR SOFFITS AND CEILINGS
07 4646	FIBER CEMENT SIDING
07 9200	JOINT SEALANTS
DIVISION 08	DOORS AND WINDOWS
08 1740	FRP FLUSH DOORS
08 3613	SECTIONAL OVERHEAD DOORS
08 4113	ALUMINUM FRAMES ENTRANCES AND STOREFRONTS
08 5113	ALUMINUM WINDOWS
08 7100	DOOR HARDWARE
08 8000	GLAZING
DIVISION 09	FINISHES
09 5113	ACOUSTICAL PANEL CEILING
09 6566	RESILIENT ATHLETIC FLOORING
09 9113	EXTERIOR PAINTING
09 9123	INTERIOR PAINTING

DIVISION 10 SPECIALTIES

10 1419	DIMENSIONAL LETTER SIGNAGE
10 2113	TOILET COMPARTMENTS
10 2800	TOILET AND BATH ACCESSORIES
10 4413	FIRE PROTECTION CABINETS
10 4416	FIRE EXTINGUISHERS
10 9999	MISCELLANEOUS SPECIALTIES

DIVISION 11 EQUIPMENT

11 0000	ICE RINK REFRIGERATION AND PIPING

DIVISION 12 FURNISHINGS

12 3661.16	SOLID SURFACING COUNTERTOPS

DIVISION 22 PLUMBING

22 0500	PLUMBING REQUIREMENTS
22 0510	PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT AND STARTUP
22 0553	PLUMBING SYSTEM IDENTIFICATION
22 0600	PLUMBING SPECIALTIES
22 0700	PLUMBING PIPE INSULATION
22 1000	PLUMBING PIPING

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING

23 0500	HVAC REQUIREMENTS
23 0553	HVAC IDENTIFICATION
23 0593	TESTING, ADJUSTING, AND BALANCING
23 0713	EXTERNAL DUCT INSULATION
23 3000	AIR DISTRIBUTION
23 7400	ROOFTOP HVAC UNIT

DIVISION 26 ELECTRICAL

26 0100	BASIC ELECTRICAL REQUIREMENTS
26 0500	COMMON WORK RESULTS FOR ELECTRICAL
26 0519	LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 0533.13	CONDUIT FOR ELECTRICAL SYSTEMS
26 0533.16	BOXES FOR ELECTRICAL SYSTEMS
26 0553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 0583	WIRING CONNECTIONS
26 0923	LIGHTING CONTROL DEVICES
26 2100	LOW VOLTAGE ELECTRICAL SERVICE ENTRANCE
26 2213	LOW VOLTAGE TRANSFORMERS
26 2416	PANELBOARDS
26 2726	WIRING DEVICES
26 2816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 2934	ENCLOSED CONTACTOR

26 5100 INTERIOR LIGHTING
26 5600 EXTERIOR LIGHTING

DIVISION 27 LOW-VOLTAGE RACEWAY/PATHWAY
27 0528 PATHWAYS FOR COMMUNICATION SYSTEM

REFERENCES:

DTE GREEN BOOK - <https://www.dteenergy.com/us/en/quicklinks/builders/builders-electric/electric-checklists-guides.html>

DIVISION 31 EARTHWORK
31 1001 CLEARING AND REMOVAL OF MISCELLANEOUS STRUCTURES
31 2301 EXCAVATION, FILLING AND GRADING
31 2500 SOIL EROSION AND SEDIMENTATION CONTROL

DIVISION 32 EXTERIOR IMPROVEMENTS
32 1123 AGGREGATE BASE
32 1300 CONCRETE CURB AND GUTTER, SIDEWALK AND MISC. PAVEMENT
32 1216 HMA PAVING
32 1500 AGGREGATE SURFACE
32 1723 PAVEMENT MARKINGS
32 9200 TURF ESTABLISHMENT

DIVISION 33 SITE UTILITIES
33 0500 ADJUSTING STRUCTURES
33 1100 WATER MAIN
33 3100 SANITARY SEWER
33 4400 STORM SEWERS

END OF SECTION 00 0110

SECTION 000110 - TABLE OF CONTENTS

Division Section Title

SERIES 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

000115	DRAWING INDEX
000116	INVITATION TO BID
002113	INSTRUCTION TO BIDDERS
004113	BID FORM
004114	BID BOND FORM
004L	CONTRACT SPECIAL PROVISIONS
004N	PERFORMANCE BOND
004O	PAYMENT BOND
004R	FEDERAL LABOR STANDARDS PROVISIONS
	CURRENT DAVIS BACON RATES
004S	PROJECT SITE POSTER
004T	CONTRACTORS PACKET
004F	MITIGATION MEASURES
005000	AVAILABILITY OF ELECTRONIC FILES
005000.1	AVAILABILITY OF ELECTRONIC FILES MAI

DIVISION 01 - GENERAL REQUIREMENTS

011000	SUMMARY
012300	ALTERNATES
012500	SUBSTITUTION PROCEDURES
012500	MATERIALS AND EQUIPEMENT
012600	CONTRACT MODIFICATION PROCEDURES
012900	PAYMENT PROCEDURES
013100	PROJECT MANAGEMENT AND CORDINATION
013200	CONSTRUCTION PROGRESS DOCUMENTATON
013300	SUBMITTAL PROCEDURES
014000	QUALITY REQUIREMENTS
014516.01	CONCRETE TESTING
014516.02	DENSITY AND AGGREGATE TESTING
015000	TEMPORARY FACILITIES AND CONTROLS
015726	DUST CONTROL
016000	PRODUCT REQUIREMENTS
017113	MOBILIZATION
01 71 23.16	CONSTRUCTION STAKING BY CONTRACTOR
017300	EXECUTION
017450	CLEANUP AND RESTOTRATION
017700	CLOSEOUT PROCEDURES
017823	OPERATION & MAINTENANCE DATA
017839	PROJECT RECORD DOCUMENTS

Division Section Title

DIVISION 02 - EXISTING CONDITIONS

024113.13 PAVEMENT REMOVAL

DIVISION 03 - CONCRETE

033000 CAST IN PLACE CONCRETE

DIVISION 04 - MASONRY

042000 UNIT MASONRY
044316.16 ADHERED STONE MASONRY
047200 CAST STONE MASONRY

DIVISION 05 - METALS

055000 METAL FABRICATIONS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

064116 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

072430 EXTERIOR FINISH SYSTEM FOR SOFFITS AND CEILINGS
074646 FIBER CEMENT SIDING
079200 JOINT SEALANT

DIVISION 08 - DOORS AND WINDOWS

081740 FRP FLUSHDOORS
083613 SECTIONAL OVERHEAD DOORS
084113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
085113 ALUMINUM WINDOWS
087100 DOOR HARDWARE
088000 GLAZING

DIVISION 09 FINISHES

095113 ACOUSTICAL PANEL CEILINGS
096566 RESILIENT ATHLETIC FLOORING
099113 EXTERIOR PAINTING
099123 INTERIOR PAINTING

SECTION 005000 - AVAILABILITY OF ELECTRONIC FILES

PART 1 - GENERAL

1.1 POLICY

- A. As a service to bidders, contractors, subcontractors, vendors, material suppliers and others needing electronic copies of drawing files, the Architect will provide CAD files via file transfer through the Project Website in accordance with the following policy.
1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
 2. It is further understood and agreed that the undersigned will hold WTA Architects harmless and indemnify WTA Architects from all claims, liabilities, losses, etc., including attorney's fees arising out of the use or misuse of the transferred items.
 3. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. All files are AutoCAD 2018. Contractor will specify on request form if an older version is required.
 4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
 5. As a record of information to be transmitted, WTA Architects will prepare a duplicate back-up for its files, which may be electronic or hard-copy.
 6. Compensation for providing this material will be as follows:
 - a. Base Fee of \$250 for 1 to 3 drawings.
 - b. Base Fee of \$500 for 4 to 10 drawings.
 - c. For each additional drawing after 10 the fee is \$40.00 per drawing (i.e. 11 drawings = \$540)
 - d. The fee will be waived for the fire protection contractor.
 7. Payment must be provided along with a signed copy of the Release Letter before files will be released.

1.2 REQUEST PROCEDURE

- A. To receive files the attached Release Letter must be completed in full and submitted to the Project Manager at WTA Architects.
1. A signed copy of the Release Letter must be submitted; faxed or emailed copies will be accepted. However, files will not be exchanged until payment has been received.
 2. Upon remittance of the signed Release Letter and Fee, allow five working days for processing.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

Date: _____

Firm Requesting Files:

Name: _____

Company: _____

Address: _____

City, State, Zip: _____

Re: Letter of Authorization for CAD File Transfers

Project Name: _____

WTM Project No.: _____

Dear Sir:

Per your request, WTA Architects will transmit the requested CAD files via file transfer through the project website upon receipt of this letter with conditions of agreement as stated.

1. By acceptance it is understood and agreed that the data and medium being supplied is to be used only for the project referenced.
2. It is further understood and agreed that the undersigned will hold WTA Architects harmless and indemnify WTA Architects from all claims, liabilities, losses, etc., including attorney's fees arising out of the use or misuse of the transferred items.
3. It is understood and agreed that the items transmitted are prepared from CAD files current at the time of preparation. All files are AutoCAD 2018, unless requested otherwise.
4. This information does not waive the need to verify and review current field conditions and the status of Addenda and/or Bulletin documentation.
5. As a record of information to be transmitted, we will prepare a duplicate back-up for our files, which may be electronic or hard-copy.
6. Compensation for providing this material will be as follows: Base Fee of \$250 for 1 to 3 drawings and a Base Fee of \$500 for 4 to 10 drawings; for each additional drawing after 10 the fee is \$40.00 per drawing (i.e. 11 drawings = \$540). All fees will be waived for the fire protection contractor. Payment must be provided along with a signed copy of this form before files will be released. Please remit to WTA Architects and allow five working days for processing.

Fee: \$ _____ Drawings: _____

Signed: _____ Printed Name/Title: _____

Firm Requesting: _____

Phone: _____ Fax: _____

To be Completed by WTA Architects, Inc.

Released (Signed By): _____ WTA Architects, Inc.

Printed Name/Title: _____ Date: _____

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

END OF SECTION 005000

SECTION 00 1000

ADVERTISEMENT FOR BID

Notice is hereby given that the Saginaw Public School District is receiving bids from trade contractors for the following project:

Port Austin Four Seasons Pavilion

Under the opportunity from the Michigan Economic Development Corporation (MEDC) – Grants Administration, Community Development Block Grant Program, the Village of Port Austin is moving forward with the purchase and construction of a Pre-Engineered Pavilion that will house the Farmer's Market during the spring, summer and fall seasons and then will be converted into a covered skating rink and all support spaces required to maintain. The pavilion will be mostly open with a portion enclosed for a small multipurpose room space, locker rooms, administration, support space and restrooms. The new pavilion sits on a site that once housed an existing structure. Slight modifications to site surroundings and parking occur. Site utilities will be re-connected. Site Electrical service will be required to be updated by DTE.

Complete proposals will be received for the following work categories in accordance with drawings and specifications as prepared by the Architect, Engineers and Construction Manager.

BID CATEGORY 1:	EARTHWORK / ASPHALT PAVING
BID CATEGORY 2:	CONCRETE
BID CATEGORY 3:	MASONRY
BID CATEGORY 4:	PRE-ENGINEERED METAL BUILDING
BID CATEGORY 5:	GENERAL TRADES
BID CATEGORY 6:	ALUMINUM WINDOWS
BID CATEGORY 7:	PAINTING
BID CATEGORY 8:	MECHANICAL
BID CATEGORY 9:	ELECTRICAL

Bids will be received at the Village of Port Austin Office until **2:00 p.m. on Tuesday, April 29th, 2025** at which time the bids will be publicly opened and read aloud. Bids may not be withdrawn for a period of sixty (60) days after the bid date.

R.C. Hendrick & Son, Inc. is the Construction Manager and/or Owner's Representative on this Project. Please do not phone, fax, or email bids to the Construction Manager. Proposals should be submitted in DUPLICATE and be addressed to:

Village of Port Austin
17 West State Street
Port Austin, MI 48467

OWNERS RESERVATION OF RIGHTS

The Owner reserves the right to reject any, part of any or all bids and to waive all informalities in the bidding procedures. The Owner reserves the right to reject any bid when Bidder fails to submit data required by the Bidding Documents, or if the bid is submitted incomplete or irregular. No telephonic, email, fax bids or modification to a submitted bid will be received or considered by the Owner.

BID BONDS

All bids must be submitted with an attached certified check or bid bond from a surety company approved to do business in the State of Michigan, payable to the Owner in an amount not less than five percent (5%) of the base bid.

PERFORMANCE BONDS

All bidders must include the cost of furnishing a performance and payment bond for 100% of their bid.

FAMILIAL DISCLOSURE

Bidders **must** provide familial disclosure in compliance with MCL 380.1267 and attach this information to the bid. The bid shall be accompanied by a sworn and notarized statement disclosing any familial relationship that exists between the Owner or the employee of the bidder and any member of the board, intermediate school board, or board of directors or the superintendent of the school district, intermediate superintendent of the intermediate school district, or chief executive officer of the public school academy. **The District shall not accept a bid that does not include this sworn and notarized disclosure statement.**

PRE-BID CONFERENCE

A virtual pre-bid meeting will be held via Zoom on April 15, 2025 at 11:00 a.m. The link to attend the meeting will be posted and sent out on Building Connected.

MILESTONE SCHEDULE

A milestone phasing plan is shown on the drawings. Overall project to be completed by Early August, 2024.

QUESTIONS / RFI's

All questions regarding the plans and specifications are to be emailed to Mike Hammis – Project Superintendent (mike@rchendrick.com). Questions regarding bidding procedures are to be emailed or you may call Mike at (989) 280-9163.

PREVAILING WAGES

Davis-Bacon wages are required on this project and contractors will be required to submit certified payrolls.

DRAWINGS, SPECIFICATIONS AND ADDENDUMS

Plans, Specifications and Addendums will be available through our Building Connected plan room. If you would like to be included on the bidders list, please email the Project Manager.

Addendums will be posted to Building Connected. Addendums will be posted no later than 12:00 Noon on the day before the bid is due. **It is the responsibility of every bidder to check the project site for addendums and note them on the bid form.**

A **Hard Copy** set of documents will be available for review at the Village of Port Austin. Hours are Monday/Wednesday/Friday from 8am to 4pm.

CONTRACT REQUIREMENTS

All contractors are required to follow all requirements of the MEDC that are included in the specification.

EQUAL OPPORTUNITY

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

END OF SECTION 00 1000

SECTION 00 2000

INSTRUCTIONS TO BIDDERS

1. DEFINITIONS

Definitions set forth in the General Conditions of the Contract Construction, AIA Document A201 – Current Edition, and in other contract documents are applicable to the Bidding Documents.

Bidding Documents: Bidding Documents include the Drawings, Specifications, Addenda prepared by the Architects, Engineers, Consultants and Construction Manager and anything referenced within those documents.

Addenda: Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

Bid: A bid is a complete and properly signed proposal to do the work for a stipulated sum, submitted in accordance with the Bidding Documents.

Base Bid: The sum stated in the Bid Form for which the Bidder offers to perform the work described in the Bidding Documents as the Base Bid.

Alternate: An alternate is an amount stated in the Bid to be added or deducted from the Base Bid if the corresponding change in the work, as described in the Bidding Documents, is accepted.

Unit Price: An amount stated as a price per unit of measurements for materials or services described in the Bidding Documents.

Bidder: A person or entity who submits a bid.

Furnish: This term is used to mean supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation and similar operations.

Install: The term is used to describe operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

Provide: To furnish and install, complete and ready for the intended use.

2. CONSTRUCTION MANAGER

R.C. Hendrick & Son, Inc. has been selected by the Owner to organize and direct the complete construction of the project and, as such, will act as a representative of the Owner in those matters so designated.

3. BIDDING PROCEDURE

R.C. Hendrick's online Plan Room is the official location for all bidding documents. **It is each bidder's responsibility to ensure that they have viewed all addenda posted to the Plan Room.** Addendums will be posted no later than 12:00 Noon on the day before the bid is due.

Bidders are to bid COMPLETE Bid Categories only. Bids for partial categories or noting any exceptions may cause your bid to be rejected. If you feel that something is part of your category that should not be included, please submit a Pre-Bid RFI.

Bidders shall include all work noted in the Bid Category Description as well as General Bid Category Notes which apply to ALL Categories.

Each Bidder by submitting this Bid to the Owner represents that they have read and understand the Bidding Documents. Each bidder also represents that they have made a site inspection, familiarized themselves with the local conditions under which the work is to be performed, and have correlated observations with requirements of the Bidding Documents.

Bids shall be submitted in TRIPLICATE. (1) One Original and (2) Two Copies of the Bid Form are required. Fill in ALL blanks on the bid form. Information must be typed or in ink. Express sums in both words and figures. The amount in words will govern in case of a discrepancy. The signer of the bid must initial all interlineations, alterations and erasures.

Enclose the bid and other documents required in a sealed envelope. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with "Sealed Bid Enclosed" printed on the envelope.

Address the envelope to the party receiving the bids and state project name, the bidder's name and address, and the designated Bid Category # for which the bid is submitted on the outside of the envelope. If you are bidding on more than one Bid Category, each bid must be in its own **clearly marked** envelope.

Bids will be **PUBLICLY** opened approximately (15) fifteen minutes after the deadline to submit bids. Only properly identified bids received on time will be opened.

4. COMBINED BIDS

If you intend on offering a discount as part of a Combined Bid, you **MUST** submit a base bid in each category and each category **MUST** be in a separate envelope. The Combined Bid must be entered on at least one Bid Form submitted by the bidder.

5. ALTERNATES

Alternates are listed on the Bid Form and are described in further detail in the Architectural Specification. Each bidder should review all Alternates and determine if what is described in the Specification and shown on the Drawings causes an addition or deduction to their Base Bid. Bidders shall indicate on the Bid Form if the Alternate is an ADD or DEDUCT to the Base Bid and indicate the costs associated. If the Alternate does not affect your scope of work, enter "No Change" in the space provided. The Owner will have the right to accept Alternates in any order or combination and to determine the low bidder on the basis of the sum of the base bid and the accepted Alternate. Alternate pricing shall be held for 180 days from bid date.

6. VOLUNTARY ALTERNATES

The bidder may submit voluntary alternates with their bid. Voluntary Alternates are changes in scope or a specification. Voluntary alternates shall be listed in the appropriate space on the Bid Form. If additional pages are necessary, attach them to the end of the Bid Form on your company letterhead. Voluntary alternates will be reviewed after the award of a contract and the Owner reserves the right to accept or reject any Voluntary Alternate.

7. QUESTIONS AND DISCREPENCIES

Notify the Construction Manager at least five (5) days prior to bid of ambiguities, inconsistencies, or error discovered upon examination of the Bidding Documents, site or local conditions. Submit requests for clarification or interpretation of the Bidding Documents in writing. Interpretation, correction, or change of the Bidding Documents will be made by Addendum, all other forms will be non-binding. Questions should be EMAILED to the Project Manager listed in the R.C. Hendrick Online Plan Room.

8. SUBSTITUTIONS

The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality. Pre-Bid substitution requests must be submitted in writing and received by the CM at least ten (10) days prior to bid date. The burden of proof of the merit of the proposed substitute is upon the proposer. The Owner's decision of acceptance or rejection of a proposed substitution will be final.

Requests for substitutions shall include:

1. The name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cut-sheets, performance, test data and other information necessary for an evaluation.
2. A statement setting forth any changes in other materials, equipment, other work that incorporation of the substitute would require, shall be included.

9. MODIFICATION OR WITHDRAWAL OF A BID

A bid may not be modified or withdrawn following the time and date designated for the receipt of bids. Prior to the time and date designated for receipt of bids, a submitted bid may be withdrawn by notice to the party receiving bids at the place designated for receipt of bids. Notice shall be in writing over the signature of the bidder or in person. Withdrawal notice shall be submitted by mail, telegram, or fax postmarked on or before the date and time for receipt of bids. Withdrawn bids may be resubmitted up to the time designated for the receipt of bids.

10. OWNER'S RESERVATION OF RIGHTS

The Owner reserves the right to reject any, part of any or all bids and to waive all informalities in the bidding procedures. The Owner reserves the right to reject any bid when Bidder fails to submit data required by the Bidding Documents, or if the bid is submitted incomplete or irregular. No telephonic, telegraphic, email, fax bids or modification to a submitted bid will be received or considered by the Owner.

The Owner will have the right to accept Alternates in any order or combination and to determine the low bidder on the basis of the sum of the base bid and the accepted Alternate.

It is the Owner's intent to award a contract to the lowest responsible and competent bidder provided the bid has been submitted in accordance with the requirements of the bidding documents and does not exceed the funds available for construction.

The Owner reserves the right to cancel the project and contract at any point. The contractor will be reimbursed for work performed up to cancellation based upon the amount of work completed.

11. SUBSURFACE MATERIALS AND SOIL BORINGS

Contractors may review test-boring data if it is available. Soil Boring data will be available either as a part of the specification or will be available as a separate file in the Electronic Plan Room. The Owner, CM, or Architect as part of Contract Drawings or Specification does not guarantee its accuracy or completeness. Contractor shall assume all responsibility in excavating for this project and shall not rely on subsurface information obtained for CM. Bidders shall make their own investigation of existing subsurface conditions; neither Owner, CM, nor Architect will be responsible in any way for additional compensation for excavation work performed under the contract due to Contractor's assumptions based on subsoil data prepared solely for Owner's and Architect's use.

12. BONDS

Bid Bond

All bids must be submitted with an attached certified check, money order, or a bid bond from a surety company approved to do business in the State of Michigan, payable to the **Owner** in an amount not less than 5% of the base bid sum of the work.

Performance Bond & Labor and Material Payment Bond

Prior to the execution of the contract, furnish bonds covering the faithful performance of the contract and the payment of all obligations arising there under. Include cost of bonds in the base bid. The bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of their power of attorney.

13. POST BID INFORMATION

The Bidder shall within seven (7) days of notification of selection for the award of the Contract for the work, submit the following information.

- A. Designation of the Work to be performed by the Bidder with his own forces.
- B. Proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the Work.
- C. List of names of the subcontractors or other persons or entities (including those who are to furnish materials or equipment fabricated to the special design) proposed for the principal portions of the Work.
- D. A list of proposed job site staff and home office staff directly involved with this Project. Indicate the qualifications, pay rates, titles, responsibilities, and duties of each person.
- E. Certificates evidencing insurance coverage in the amounts and types specified.
- F. An interim construction schedule in a bar graph format.
- G. A completed Schedule of Values in the format provided by the Owner.

The Bidder will be required to establish to the satisfaction of the Owner, the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

Prior to the award of the Contract, the Bidder will be notified in writing. If the Owner has reasonable objection to any proposed person or entity, the Bidder may at his option, (1) withdraw his bid or (2) submit an acceptable substitute person or entity with an adjustment in cost occasioned by such substitution. The Owner may at his discretion, accept the adjusted bid price or disqualify the Bidder.

The Owner reserves the right to request financial statements from the bidder before the award of a contract.

14. PRE-AWARD INTERVIEW

The selected Contractor as determined by the Owner will be required to attend a pre-contract award interview at the job site office of R.C. Hendrick & Son, Inc. for the purpose of reviewing the submitted bid for compliance with specified products, methods of installation, warranties, general job procedures, post bid information and related items.

Meeting minutes of the pre-contract interview will be taken by a representative of R.C. Hendrick & Son, Inc. Before concluding the interview, the minutes will be signed by those in attendance.

15. TAXES

Each bidder shall include in their proposal, and agree to pay, all fees and taxes including Sales and Use which they may be required to pay in connection with the performance of the contract. Also, the bidder includes and agrees to pay for all contributions to unemployment compensation, health and welfare, appropriate benefits, or other purposes now or hereafter during the term of the contract and the Owner and Construction Manager shall not be liable for any additional charges.

16. INDEMNIFICATION AND GENERAL LIABILITY INSURANCE

Each trade contractor shall agree to indemnify and hold harmless the Owner, Architect and R.C. Hendrick from and against any and all general liability claims whatsoever arising out of or occurring during and occasioned directly or indirectly by its negligence or fault. Prior to entering into a contract, each trade contractor shall provide evidence satisfactory to the Owner, Architect and R.C. Hendrick of adequate general liability insurance coverage which names the Owner, Architect and R.C. Hendrick as additional insured. Each trade contractor shall also provide evidence of Worker's Compensation Insurance in the amounts required by the State of Michigan.

17. LOCAL PRODUCTS

All prime bidders, subcontractors and suppliers shall utilize products that are local to the region or State whenever possible where price, quality and performance are equal to or better than non-local products.

18. MINORITY SUBCONTRACTORS

Bidders are encouraged to use the services of minority subcontractors if possible in the pursuance of this project.

19. NON-COLLUSION CLAUSE

By submitting and signing the proposal form, the bidder declares that neither the bidding firm nor agents of the bidding firm or any other members of the proposed team have entered into any collusion or agreement concerning any aspect of the proposal.

20. CONSTRUCTION DOCUMENT RESPONSIBILITIES

All bidders are responsible for the COMPLETE set of drawings and specifications including the CM Issued Front-End, Technical Specifications (Architectural, Mechanical, and Electrical), Drawings (Civil, Structural, Architectural, Mechanical, Electrical, etc.). Bidders are to familiarize themselves with the work of other trades and participate in the coordination of work activities.

All bidders are to include, in their entirety, the work and instructions described in Division 0 – “Bidding and Contract Requirements” and Division 1 – “General Requirements.”

21. WARRANTY

All work shall be guaranteed for a period of twelve (12) months from the date of substantial completion of the entire Bid Package unless more specifically stated in the contract documents. All service during this 12-month period shall be rendered without charge to the Owner. This 12-month warranty does not replace any longer warranties required by the specification.

22. SITE VISIT

All contractors are required to visit the site to familiarize themselves with existing conditions either through the Pre-Bid Conference or through a visit you have scheduled with R.C. Hendrick. Contractors shall not visit or walk through the site without permission from R.C. Hendrick.

23. FORMAT OF ELECTRONIC SUBMITTALS

When submitting information electronically all contractors shall use the Portable Document Format (.pdf) for all email attachments. Forms and requests that are submitted in a different format may be rejected resulting in delays to the schedule and payments.

24. ADDITIONAL SETS OF DRAWINGS AND SPECS

The Owner will not furnish additional sets to the successful bidder(s). Contractors will need to purchase or reproduce additional sets of plans and specifications at their own expense.

END OF SECTION 00 2000

SECTION 00 2200

BID CATEGORY GENERAL NOTES

The following are General Notes that apply to all bid categories.

1. All bid categories are to include all sections in Division 0 and Division 1 in their entirety.
2. Full compliance with all the safety regulations and requirements of Federal OSHA, MIOSHA, State Authorities, Local Authorities and the Construction Manager. Failure to do so will cause this contractor to be removed from the site. (Hard Hats, Work Boots, Safety Glasses, and Hi-Vis must be worn at all times.)
3. R.C. Hendrick uses an online system called Building Blok for all submittals. Contractors must upload all submittals to this online system. Refer to Specification section 01 3300 – Submittal Procedures. RCH will hold one training session for contractors not familiar with the program. There is no cost incurred by contractors for using this online system.
4. Recycling of demolished materials by the Contractor and Subcontractor is encouraged provided that the materials are not marked on the drawings or in the specification to be salvaged and returned to the Owner. Any expected recycling earnings by the Contractor or Subcontractor should be reflected in their bid pricing. Recycled materials are not to be stockpiled and must be removed at least weekly from the site. Individual recycling (“dumpster diving”) of demolished materials is not permitted on site.
5. Smoking and use of Drugs or Alcohol on School property is strictly prohibited! Guns are not allowed on school property whether you have a concealed carry permit or not.
6. The maximum allowable markup on Changes in the Work shall be eleven percent (11%) which includes overhead, profit, estimating expenses, other office expense, bond and insurance costs.
7. Each Contractor shall furnish and maintain a trash receptacle, clearly marked with their company name in the vicinity of every work area for their daily use. This shall be emptied on a regular basis.
8. Contractor and Employee name shall be placed on all hard hats.
9. Drinking water is the responsibility of contractors for their crews.
10. Contractors are required to perform daily and weekly cleanup as defined in Specification Section 017100. This to include proper dust control as generated by their construction activities. Dumpsters provided by owner. No concrete, wood pallets, cardboard, or masonry.
11. Contact “Miss Dig” three days prior to any excavations, or underground work.

12. All contractors are to cooperate with testing agencies hired by the owner. This to include advance notification to the construction manager of activities requiring testing. (Compaction, soil bearing, concrete, steel, etc.) Additional costs associated with failed tests will be passed on to the contractor whose work did not pass.
13. This project will require permits and inspections. Contractors shall pull permits and schedule inspections as required by the governing authority. The owner and construction manager shall obtain and pay for a building permit only.
14. Each contractor is responsible for all layout and field dimensions associated with their work.
15. Contractors shall remove mud and debris from streets and walks as a result of their work activities and deliveries.
16. Fill out electronic Daily Report on Building Blok each day, and upload a “tool box talk” weekly.
17. Upload all start up documents to Building Blok within 15 working days from receipt of Notice to Proceed. Startup documents to include signed contracts, Schedule of Values, Certificate of Insurance, Shop Drawings and Submittals, Contractors Safety Program and Current SDS Files.
- 18. Contractors are to review all drawings & notes, including – but not limited to civil, architectural, structural, mechanical and electrical, and include all work as defined in their respective bid category.**
19. Include sales tax and bond premiums in base bids.
20. Contractors are to put forth their best effort to protect existing finishes and newly installed products from damage.
21. Provide all lifting, hoisting, scaffolding, etc. as required for the full installation of your work. Schedule deliveries during normal working hours. Setting of RTU, curbs, equipment, etc. shall be scheduled a minimum of 1 week in advance.
22. Contractors **must have foreman** attend weekly job progress meetings while on site and when requested by R.C. Hendrick & Son, Inc. Progress meetings will be available virtual as well.
23. Contractor-supplied materials shall be stored in contractor provided storage units unless arrangements are made with the Construction Manager in advance. R.C. Hendrick & Son, Inc. **will not** unload materials for any contractor.
24. All contractors are to participate in keeping the site secure at the end of each workday. Contractors are to shut windows/doors and lock gates at the end of each workday.
25. All openings made by contractors shall be covered and maintained by the contractor creating the opening until permanent finishes or equipment is installed. Firestopping of openings in walls shall be done by the contractor who created the opening.

END OF SECTION 00 2200

BID CATEGORY # 1

EARTHWORK AND ASPHALT PAVING

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

02 4113.13	PAVEMENT REMOVAL
31 1001	CLEARING AND REMOVAL OF MISCELLANEOUS STRUCTURES
31 2301	EXCAVATION, FILLING AND GRADING
31 2500	SOIL EROSION AND SEDIMENTATION CONTROL
32 1123	AGGREGATE BASE
32 1216	HMA PAVING
32 1500	AGGREGATE SURFACE
32 1723	PAVEMENT MARKINGS
32 9200	TURF ESTABLISHMENT
33 0500	ADJUSTING STRUCTURES
33 1100	WATER MAIN
33 3100	SANITARY SEWER
33 4400	STORM SEWERS

Bid Category Notes (Including, but not limited to):

1. Protect all open excavations.
2. Furnish, install and maintain all soil erosion measures for the duration of the project. Owner shall pay for Soil Erosion Permit. **This contractor to fill out all paperwork on the owner's behalf.** Provide a storm water operator to review soil erosion measures as required. SESC book shall be kept on site and filled out weekly and/or after each event as required by the soil erosion permit.
3. Keep site graded and accessible to contractors.
4. All site demolition debris is to be hauled off site and disposed of properly.
5. Include all site demolition, concrete removal, saw cutting, asphalt removal, asphalt pulverizing or milling, trees, shrubs, etc. as indicated or required for new Sitework.
6. Obtain and pay for permits and inspections of all underground work if necessary.
7. Provide all exterior concrete/asphalt cutting, excavation, shoring, grading, compaction, backfill, berms and off-site fill to final subgrade elevations as shown or specified, including backfill required around foundation walls, retaining walls, sidewalks, drives, equipment pads, etc. This to include rough and final grading to +/- .10 foot below bottom of finish paving. Provide extra material for fine grading by others as needed.
8. Provide all dewatering (ground and rain water) as necessary to perform the work within this package.
9. No changes in grade or line are allowed without approval of the Construction Manager or Architect/Engineer.

10. Coordinate and cooperate with testing firm hired by the owner to ensure proper backfill procedures to meet bearing capacity as shown or specified.
- 11. Provide dust/mud control throughout project duration. This may require sweeping and/or vacuuming of drives and/or walks as needed. This may also require the use of a water truck to keep dust to a minimum.**
- 12. Area roadways are to be kept clean of dirt and debris generated by construction activity.**
13. Provide, place and fine grade topsoil upon completion of work activities. Provide seeding or hydroseeding to disturbed areas as per plans and specifications.
14. Provide maintenance of newly planted grass areas as called for in specifications.
15. Provide periodic compaction of owner supplied dumpsters at the request of the CM.
16. Fine grade aggregate base prior to installation of base course.
17. Include all pavement markings.
18. Clean up loose asphalt particles upon completion of each course of asphalt placement.
19. Include all barricading and flagging as necessary.
20. Provide and install parking lot signage as shown or called for.

BID CATEGORY #2

CONCRETE

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

03 3000	CAST-IN-PLACE CONCRETE
32 1300	CONCRETE CURB AND GUTTER, SIDEWALK AND MISC. PAVEMENT

Bid Category Notes (Including, but not limited to):

1. Furnish, form, and install all concrete for footings, foundations, slabs on grade, concrete decks, equipment/generator pads, etc.
2. Include all layout for your work.
3. Furnish, form and install all exterior site concrete.
4. Provide all fine grading for interior/exterior concrete.
5. Coordinate installation of footings to ensure proper inspection prior to placement of footings.
6. Provide proper curing and sealing of concrete as shown or specified. Include sealer for all exposed concrete floors as specified.
7. Provide proper rebar protection as required by MIOSHA.
8. This contractor to provide floor and wall scraping of concrete "splatter" from the installation of their work. Re-check/re-scrape after installation of block filler and prior to placement of sealers and/or paints on exposed CMU surfaces.
9. Protect all exposed finishes during installation of this work.

BID CATEGORY #3

MASONRY

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

04 2000	UNIT MASONRY
04 4316.16	ADHERED STONE MASONRY
04 7200	CAST STONE MASONRY

Bid Category Notes (Including, but not limited to):

1. Contractor is to provide wall bracing plans to the Construction Manager prior to start of work. Wall bracing plans must be approved by a structural engineer as required by MIOSHA.
2. Provide proper bracing of walls as required by MIOSHA and the Masonry Institute. **Current MIOSHA standards MUST be followed at ALL times.** Provide proper barricades and signage as required by MIOSHA during construction of wall through completion of structural steel joists and deck. Signage and barricading shall not be removed until CM approves.
3. Provide all lintels, attachments, etc. as required to secure new wall to existing structure.
4. Furnish and install brick, block, stone veneer assemblies, concrete masonry units, architectural precast concrete, through wall flashing, anchors, weeps, vents and other accessories as necessary for a complete system.
5. Furnish and install horizontal and vertical wall reinforcement where shown or specified.
6. Provide shop drawings showing placement of reinforcing steel.
7. Provide mockup of block/brick wall assemblies *if* specified.
8. Furnish and install all openings and chases as work progresses. This bid category is to review architectural, mechanical and electrical drawings on a daily basis and notify other trades of items passing through walls to ensure proper openings and locations of openings are created during the construction of the wall and to notify CM of required lintels in advance of wall construction.
9. Furnish and install all insulation associated with masonry and/or cast stone including but not limited to fire-safing at masonry cavities and where masonry walls extend to deck. Many ceilings are exposed – refer to drawings. Where masonry walls extend to deck, contractor shall include costs to complete masonry to deck work upon completion of joist and deck installation.
10. Include all UL Listed firestopping and fireproofing of masonry walls during erection. Fire rating of openings created after installation of masonry is the responsibility of the contractor creating the opening.
11. Install anchor bolts, bearing plates and miscellaneous items in masonry as shown or specified.
12. This contractor is to thoroughly clean all concrete floors and masonry walls of excess mortar prior to painting and floor finishes.

13. Install new openings in existing walls for installation of louvers, vents, and misc. items. Coordinate with mechanical opening sizes for new unit ventilator louvers. Remove existing brick and salvage. Provide and install steel/masonry lintels as required.
14. This contractor to re-scrape masonry walls after application of block filler and prior to placement of finish paint and/or ceramic tile.
15. This bid category shall provide a dumpster or trailer for removal of all masonry materials including CMU. Materials shall not be left on site in piles.
16. This bid category to provide dust control for their activities; cutting, mixing and driving equipment around the site. Saw cutting is to be performed using a wet method.
17. Provide any grouting of frames as shown or called for.
18. Provide any damp proofing as required.
19. Provide all interior and exterior caulking of control joints, corners, lintels, door frames in masonry walls, etc.
20. Place wall ratings on all new masonry walls above ceilings at a minimum of 20' intervals. Ratings can be shown by signs permanently affixed to wall or by use of stencil and spray paint.

BID CATEGORY #4

PRE-ENGINEERED METAL BUILDING

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

Bid Category Notes (Including, but not limited to):

Design & Engineering

- Provide structural engineering and stamped calculations for the complete PEMB system in accordance with all applicable codes and project requirements.
- Coordinate all loads and attachment points for mechanical, electrical, and architectural components.
- Submit shop drawings for review and approval.

Materials Supply

- Furnish all components for a complete PEMB system, including:
- Primary and secondary framing (columns, rafters, purlins, girts)
- Roof panels and wall panels (metal sheeting)
- All fasteners, closures, trim, gutters, downspouts, ridge caps, and sealants
- Insulation systems per the drawings and specifications
- Framed openings and flashing for windows, doors, and equipment penetrations

Installation

- Erect all structural framing, wall and roof systems, and associated components
- Install insulation in roof and walls per thermal requirements
- Provide and install flashing, trim, weatherproofing, and sealants to ensure a watertight envelope
- Provide all labor, tools, equipment, and supervision for installation
- Coordination with the Concrete Contractor for embed layout and anchor bolt placement
- Coordination with Mechanical, Electrical, and Plumbing trades for roof and wall penetrations

Accessories & Details

- Furnish and install snow guards or ice stops if required
- Install vents, louvers, or translucent panels if shown
- Install any integrated canopies, overhangs, or awnings included in the design

Coordination

- Coordinate anchor bolt placement and slab edge conditions with Concrete Contractor
- Coordinate roof openings and curbs with Mechanical and Electrical trades
- Submit proposed erection sequence to Construction Manager for approval
- Attend coordination meetings and participate in clash resolution as needed

Quality Assurance

- Ensure installation is per manufacturer's recommendations and project specifications
- Conduct a punch list walk with the CM and Owner upon completion
- Provide warranty for materials and workmanship as specified

BID CATEGORY #5

GENERAL TRADES

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

05 5000	METAL FABRICATIONS
06 4116	PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS
07 2430	EXTERIOR FINISH SYSTEM FOR SOFFITS AND CEILINGS
07 4646	FIBER CEMENT SIDING
07 9200	JOINT SEALANTS
08 3613	SECTIONAL OVERHEAD DOORS
09 5113	ACOUSTICAL PANEL CEILING
09 6566	RESILIENT ATHLETIC FLOORING
10 1419	DIMENSIONAL LETTER SIGNAGE
10 2113	TOILET COMPARTMENTS
10 2800	TOILET AND BATH ACCESSORIES
10 4413	FIRE PROTECTION CABINETS
10 4416	FIRE EXTINGUISHERS
10 9999	MISCELLANEOUS SPECIALTIES
12 3661.16	SOLID SURFACING COUNTERTOPS

Bid Category Notes (Including, but not limited to):

1. Furnish all layout for this bid category. CM/Owner to provide control lines and benchmark elevation only.
2. Provide and install all exterior and interior rough and finish carpentry items including frames, nailers, blocking, plywood sheathing, etc.
3. Furnish all fasteners necessary for all work included in this bid category. Provide anchors needed for your work to other trades for installation.
4. Provide wood or sheet metal blocking in gypsum walls for toilet partitions, markerboards/tackboards, casework, and any miscellaneous accessories requiring such.
5. Provide and install bathroom partitions and toilet/bath accessories.
6. Provide primer touch up and cleaning of hollow metal frames prior to painting.
7. Provide all caulking and sealants required for this bid category.
8. Provide misc. structural steel and metal fabrications as shown or called for.

BID CATEGORY #6

ALUMINUM WINDOWS AND GLAZING

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

08 1740	FRP FLUSH DOORS
08 4113	ALUMINUM FRAMES ENTRANCES AND STOREFRONTS
08 5113	ALUMINUM WINDOWS
08 7100	DOOR HARDWARE
08 8000	GLAZING

Bid Category Notes (Including, but not limited to):

1. Furnish and install all glazing shown or specified.
2. Remove all stickers, labels and excess caulking from glass and frames upon completion.
3. Include all sealants to complete this work, glass to aluminum, aluminum to aluminum, aluminum to adjacent surfaces, interior and exterior
4. Include all metal angles, clips, fasteners, shims, etc. required for complete installation.
5. Furnish and install aluminum covers, sills, mullions, trim, etc. where aluminum systems abut other finishes and/or are shown to incorporate structural members.
6. This contractor shall provide shop drawings within 45 calendar days of Notice to Proceed.
7. Provide all field measurements for your work.
8. Provide all hoisting, lifting and storage of materials.

BID CATEGORY #7

PAINTING

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

09 9113 EXTERIOR PAINTING
09 9123 INTERIOR PAINTING

Bid Category Notes (Including, but not limited to):

1. Include painting of exposed steel, lintels, mechanical, electrical, etc. as shown or specified.
2. Include all interior and exterior painting as shown or specified.
3. Provide painting of exposed gas lines as required.
4. Include prep of existing walls as required. This to include minor patching of nail/screw holes and misc. removal of tape, adhesives, etc.
5. Provide touch-up as needed upon completion of remaining finishes (casework, carpentry, lockers, fixtures, etc.)
6. Provide finishing of all wood trim and millwork shown or called out.
7. Protect all surfaces not requiring painting.
8. Provide and install painters caulk around all existing finishes prior to painting as required.
9. Review mechanical/electrical drawings – include painting of any exposed piping or duct as shown or specified.

BID CATEGORY #22

MECHANICAL

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

11 0000	ICE RINK REFRIGERATION AND PIPING
22 0500	PLUMBING REQUIREMENTS
22 0510	PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT AND STARTUP
22 0553	PLUMBING SYSTEM IDENTIFICATION
22 0600	PLUMBING SPECIALTIES
22 0700	PLUMBING PIPE INSULATION
22 1000	PLUMBING PIPING
23 0500	HVAC REQUIREMENTS
23 0553	HVAC IDENTIFICATION
23 0593	TESTING, ADJUSTING, AND BALANCING
23 0713	EXTERNAL DUCT INSULATION
23 3000	AIR DISTRIBUTION
23 7400	ROOFTOP HVAC UNIT

Bid Category Notes (Including, but not limited to):

1. This package is to furnish and install a complete Mechanical system including ice/refrigeration.
2. Provide openings through the roof for kitchen hood and other mechanical penetrations. Provide roof flashing and repair.
3. Provide removal of old heating equipment and installation of new Unit Ventilators and piping as shown or called for. Existing steam lines will need to be properly capped to ensure steam system stays in operation until new boiler system is fully complete.
4. Furnish drawings showing size and location of concrete pads required for mechanical equipment to Construction Manager for installation by the concrete contractor.
5. Furnish and install all sleeves in walls, floors, roofs and ceilings that may be required for this Bid Category.
6. Pay for all permits, fees, inspections and approvals required by governing jurisdictions. This will include coordination between state and local agencies to ensure code compliance and for securing approval for the facility.
7. This contractor shall be responsible for all fire wall/floor penetrations required for this work and proper sealing of the same.
8. Coordinate delivery and storage of material with the Construction Manager prior to delivery. Remove all cardboard from site and recycle or discard.
9. Open ductwork and piping shall have ends sealed during delivery and construction to reduce amount of dust and dirt within.

10. Furnish and install caulking and sealers around the plumbing fixtures, pipe, ductwork, louvers, etc.
11. Furnish templates for cutting of counter tops (by others) to the Construction Manager.
12. Provide and install pipe identification and other required identification or signage related to this Bid Category.
- 13. This Bid Category is also responsible for Mechanical Requirements as shown on the Architectural and Electrical Drawings.**
14. Provide a complete mechanical system that includes all piping, ductwork, temperature controls, insulation, fixtures, Boilers, chillers, pumps, RTU's, ductwork, gas piping.
15. Provide and install all mechanical equipment including but not limited to Unit Ventilators, Temperature Control System, Air/Water Balance and Testing, etc.
16. Remove and replace exterior louvers as shown or called for. Verify sizes prior to ordering.
17. The Mechanical and Electrical Contractors will be required to coordinate with each other to accomplish final layout. Any relocation required to coordinate work will be done at no additional cost to the owner. All contractors are required to furnish layout and coordination prints for their work prior to installation.
18. Furnish access panels that may be required but are not shown. To be installed by others.
19. Furnish and install all interior floor drains, floor sinks, trench drains, cleanouts, etc.
20. Provide cleaning and testing of all piping systems for the work within this category.
21. Provide and install any/all water meters and backflow preventers for domestic water service as shown, specified, or needed to provide a complete system.
22. Provide a copy of all mechanical and plumbing permits to the CM as soon as applied for and received.
23. Provide UL listed Firestopping at all pipe, duct and control wiring locations.
24. Include all refrigeration and ice equipment/piping.
25. Include all excavation and backfill for your underground work.
26. All utilities will be brought to 5' of the building by the Earthwork trade. Extend all building utilities to 5' outside of the building and do all final connections.

BID CATEGORY #23

ELECTRICAL

The work scope for this Bid Category includes, but is not limited to the work as specified in the R.C. Hendrick Project Manual, the Architect's Technical Specification, the Drawings and any Addenda issued prior to the bid date.

Provide all labor, materials and equipment to satisfy the following Specification Sections and Notes unless otherwise noted.

26 0100	BASIC ELECTRICAL REQUIREMENTS
26 0500	COMMON WORK RESULTS FOR ELECTRICAL
26 0519	LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 0533.13	CONDUIT FOR ELECTRICAL SYSTEMS
26 0533.16	BOXES FOR ELECTRICAL SYSTEMS
26 0553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 0583	WIRING CONNECTIONS
26 0923	LIGHTING CONTROL DEVICES
26 2100	LOW VOLTAGE ELECTRICAL SERVICE ENTRANCE
26 2213	LOW VOLTAGE TRANSFORMERS
26 2416	PANELBOARDS
26 2726	WIRING DEVICES
26 2816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
26 2934	ENCLOSED CONTACTOR
26 5100	INTERIOR LIGHTING
26 5600	EXTERIOR LIGHTING
27 0528	PATHWAYS FOR COMMUNICATION SYSTEM

Bid Category Notes (Including, but not limited to):

1. Include the supply and install of power, electrical, and misc. shut down requirements to all mechanical units units.
2. This contractor to provide excavation and backfill as required for new work.
3. Provide all demolition of electrical items as shown or specified. Contractor shall consult with CM for equipment/materials to be turned over to owner. Provide dumpster as required for demo items.
4. Provide and install temporary lighting as required by MIOSHA and as needed to ensure sufficient lighting for construction. **Temporary lighting shall be switched and must be instant on/off type.** Metal Halide and similar lights which require long startup will not be allowed. R.C. Hendrick will determine if lighting is sufficient for construction.
5. Furnish drawings showing size and location of concrete pads required for electrical equipment to Construction Manager. Installation of these pads will be by others.

6. This contractor shall be responsible for all fire wall penetrations required for this work and proper sealing of the same.
7. **This Bid Category is also responsible for Electrical Requirements as shown on the Architectural, Civil and Mechanical Drawings. Review all drawings prior to bidding.**
8. Coordinate delivery and storage of material with the Construction Manager **prior** to delivery.
9. Pay for all permits, fees, inspections and approvals required by governing jurisdictions. This will include coordination between state and local agencies to ensure code compliance and for securing approval of the facility.
10. Include all cutting and coring of walls, floors, ceilings, etc. as required for the installation of this work.
11. Provide a complete electrical system including, but not limited to; all wiring, panelboards, fixtures, fire alarm systems, lighting controls, sound systems, low voltage, etc.
12. Provide Network / Communication raceways as shown or specified.
13. Furnish access panels required for all electrical items, which require access in inaccessible areas. Access panels to be installed by General Trades.
14. Final cleaning of fixtures and equipment is by others. This contractor to protect fixtures from damage during storage.
15. All inspection reports from local, state and federal inspection agencies will be provided to the Construction Manager.
16. Duct smoke detectors shall be provided and installed by this Bid Category.
17. Provide and install all motor starters, disconnects, etc. as shown or specified.
18. Provide electrician on site upon startup of mechanical units to verify proper rotation and power.
19. The Mechanical and Electrical Contractors will be required to coordinate with each other to accomplish final layout. Any relocation required to coordinate work will be done at no additional cost to the owner. All contractors are required to furnish layout and coordination prints for their work prior to installation.

SECTION 00 3100

INFORMATION AVAILABLE TO BIDDERS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SOIL EVALUATION – **NOT INCLUDED**

- 1.2.1 This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of the designers.
- 1.2.2 The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.
- 1.2.3 This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting additions or deductions to the Contract Sum accruing to the Owner.

SECTION 00 3113

MILESTONE SCHEDULE

All bid categories shall participate in coordinating the construction schedule with both the Construction Manager and other trade contractors to meet the Milestone Dates indicated in the bidding documents. The dates either listed below or on the attached schedule are not intended to be a complete breakdown of the work; rather it is a list of milestone dates that must be met by all trade contractors to ensure the project is completed on time. Trade contractors shall include all costs they feel are necessary to complete the work by these milestone dates and include all overtime and shift work even if not called for in the scope description. All trade contractors shall endeavor to improve upon the milestone dates if possible.

If a bidder feels that the dates given are unreasonable or they are impossible to meet, they are to notify R.C. Hendrick by email prior to the bid date. R.C. Hendrick will review the request and, if necessary, issue an addendum modifying the Milestone Schedule. If no objections are heard, it will be understood that the Milestone Schedule can be met by all trade contractors.

Meeting the schedule is an imperative part of the project to all parties, therefore R.C. Hendrick reserves the right to take or recommend the following action(s) if the milestone dates are in danger of, or not being met.

1. R.C. Hendrick will request a written recovery schedule from the trade contractor(s).
2. The trade contractor(s) will be directed to increase crew size or add equipment on site.
3. The trade contractor(s) will be directed to add a second shift or work overtime.
4. If the above measures do not fulfill the requirements of the Milestone Schedule, the trade contractor(s) may be supplemented with additional personnel or equipment by others, or any necessary action required.

All costs associated with the above measures will be the responsibility of the trade contractor(s) involved, to the extent that it was delayed by others. If a trade contractor is found to have delayed the work, they will be responsible for any additional costs necessary to get the project back on schedule.

Milestone Schedule:

A milestone schedule will be issued via addendum.

END OF SECTION 00 3113

SECTION 00 3146

PERMITS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 PERMITS AND FEES

- 1.2.1 The Owner, through the Construction Manager shall pay for and furnish the general Building Permit.
- 1.2.2 Other than the Building Permit, each Trade Contractor is required to secure and pay for all permits and fees necessary for your scope of work.
- 1.2.3 The Construction Manager shall schedule the General Building Inspection. Trade Contractors will be notified verbally or in writing of the date of inspection(s).
- 1.2.4 It is the responsibility of each Trade Contractor to schedule appropriate inspections of the work by the authorized inspector of the permit you secured. The Construction Manager is to be notified immediately of any scheduled inspection(s).
- 1.2.5 This project is under the following jurisdictions:

Building	Local Authority
Life Safety	Local Authority
Mechanical	Local Authority
Plumbing	Local Authority
Electrical	Local Authority
Elevator	NA
Right of Way	Local Authority
Demolition	NA
Soil Erosion	Local Authority

END OF SECTION 00 3146

SECTION 00 4000

BID FORM

TO: Village of Port Austin
17 West State Street
Port Austin, MI 48467

RE: Port Austin Four Seasons Pavilion

Having carefully reviewed the bidding documents described in Section 001000 and understanding the scope of work involved in the proposed Bid Category and those that interface with it, we hereby propose to furnish labor, materials, tools, equipment, supervision, insurance and services required for the completion of all work required for the Bid Category indicated in accordance with the Bid Category Description and the Contract Documents prepared by the Architect and Construction Manager

BID CATEGORY #: _____ **DESCRIPTION:** _____

BIDDERS NAME: _____

BASE BID:

Total Base Sum of _____
_____ Dollars \$ _____

(OPTIONAL) COMBINED BID FOR CATEGORIES _____:

Total Combined Sum of _____
_____ Dollars \$ _____

ADDENDA:

And Having Received and Examined the Following Addenda: (include date for acknowledgement)

Addendum #: _____ Date: ____/____/____

Addendum #: _____ Date: ____/____/____

Addendum #: _____ Date: ____/____/____

Addendum #: _____ Date: ____/____/____

Addendum #: _____ Date: ____/____/____

Addendum #: _____ Date: ____/____/____

ALTERNATES:

Bidders shall indicate on the Bid Form if the Alternate is an ADD or DEDUCT to the Base Bid and indicate the costs associated. See Specification Section 012300 for the full descriptions. If the Alternate does not affect your base bid you must circle NO CHANGE.

Alternate No. 1: South Façade Windows:

1. Base Bid: Furnish and install storefront style clear anodized window system as shown in construction documents.
2. Deduct Alternate: Continue adjoining exterior hardi-board construction to bottom eave in lieu of installing windows.

ADD \$ _____

DEDUCT \$ _____

NO CHANGE

Alternate No. 2: Athletic Rubber Flooring:

1. Base Bid: Furnish and install athletic rubber flooring as specified in Vestibule 106, Women's Toilet Room 103 and Men's Toilet Room 104.
2. Deduct Alternate: Install sealed concrete floor finish.

ADD \$ _____

DEDUCT \$ _____

NO CHANGE

UNIT PRICES:

Unit prices shall include all necessary material plus costs for delivery, installation, insurance, bonds, applicable taxes, overhead and profit. See the drawings and Section 01 2200 for the full description.

Unit Price No. 1 Use this line for Unit Price #1 if necessary \$ _____ per _____**Unit Price No. 2** Use this line for Unit Price #2 if necessary \$ _____ per _____**Unit Price No. 3** Use this line for Unit Price #3 if necessary \$ _____ per _____**VOLUNTARY ALTERNATES / SUBSTITUTIONS:**

Bidder is cautioned to bid on the "Standards" specified. The following substitutions from the "Standards" specified are listed herein for consideration, and if accepted, the contract sum may be adjusted in accordance with the following:

_____ Add / Deduct \$ _____

_____ Add / Deduct \$ _____

EXPERIENCE MODIFICATION RATE (EMR):

Village of Port Austin
Port Austin Four Season Pavilion

R.C. Hendrick Project No. 34821
00 4000 – Bid Form

List the EMR for your firm as described by your insurance carrier for the past three (3) years.

2024 _____ 2023 _____ 2022 _____

TIME AND MATERIAL RATES: (REQUIRED)

Labor rates listed below include the following: Cost of labor including Michigan Single Business Tax, Social Security and Medicare, Federal and State Unemployment tax, and Fringe Benefits Under Collective Bargaining Agreements, and Worker's Compensation Insurance. The rates listed below do not include overhead and/or profit. These rates are only for additions and/or deletions to the contract that could not have been anticipated at the time of the bid.

Trade	Straight Time	Shift Time	1 ½ Time	Double Time

WORK TIME:

The undersigned hereby agrees to complete the entire work per the Milestone Schedule.

CONTRACT:

The undersigned agrees that the above Base Bid Prices shall hold for 60 days and Alternate Prices for 120 days after receipt of proposals, to accept provisions of "Instructions to Bidders."

IRAN BUSINESS RELATIONSHIP AFFIDAVIT:

Pursuant to the Michigan Iran Economic Sanctions Act, 2012 P.A. 517, by submitting a bid, proposal or response, Respondent certifies, under civil penalty for false certification, that it is fully eligible to do so under law and that it is not an "Iran Linked Business," as that term is defined in the Act.

ESTIMATOR CONTACT INFO:

Please provide contact information for the estimator who completed this bid:

Name: _____ Phone: _____

Email Address: _____

SUBMITTED BY:

Firm Name: _____

Address: _____

City/ST/Zip: _____

Email Address: _____

Signed: _____ Title: _____

Typed Name: _____ Date: _____

Phone: _____ Fax: _____

If Bidder is a Corporation, indicate State of Incorporation: _____

If a Partnership, give full names of all Partners: _____

Please submit (2) copies and retain (1) copy for your records.

END OF SECTION 00 4000

SECTION 00 5000

CONTRACT / AGREEMENT FORM

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 CONTRACT / AGREEMENT FORM

- 1.2.1 Contracts will be direct between the Owner and the Trade Contractor.
- 1.2.2 The form of agreement will be the Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition, AIA Document A132-2009.
- 1.2.3 A sample copy of the agreement form can be viewed or downloaded at: www.rchendrick.com. Click on "Plan Room" and then click on the link "Specification Forms."

END OF SECTION 00 5000

SECTION 00 6100

BONDS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 BID BONDS

- 1.2.1 Each bid must be submitted with an attached certified check, money order, or a bid bond from a surety company approved to do business in the State of Michigan, payable to the **Owner** in an amount not less than 5% of the base bid sum of the work.

1.3 PERFORMANCE AND PAYMENT BONDS

- 1.3.1 Prior to the execution of the contract, furnish bonds covering the faithful performance of the contract and the payment of all obligations arising there under. Include cost of bonds in the base bid. The bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of their power of attorney.
- 1.3.2 A sample Bid Bond Form is attached to this section.

END OF SECTION 00 6100

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we the undersigned, _____ as PRINCIPAL, AND _____, as SURETY are held and firmly bound unto _____ hereinafter called the Grantee/Local Public Agency in the penal sum of _____

Dollars, (\$ _____), lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that Whereas the Principal has submitted the Accompanying Bid,
dated _____, _____, for _____.

NOW, THEREFORE, if the Principal shall not withdraw said Bid within the period specified therein after the opening of the same, or, if no period be specified, within thirty (30) days after the said opening, and shall within the period specified therefore, or if no period specified, within ten (10) days after the prescribed forms are presented to him for signature, enter into a written Contract with the Grantee/Local Public Agency in accordance with the Bid as accepted, and give bond with good and sufficient surety or sureties, as may be required, for the faithful performance and proper fulfillment of such contract; or in the event of the withdrawal of said Bid within the period specified, or the failure to enter into such Contract and give such bond within the time specified, if the Principal shall pay the Grantee/Local Public Agency the difference between the amount specified in said Bid and the amount for which the Grantee/Local Public Agency may procure the required work or supplies or both, if the latter be in excess of the former, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several seals this _____ day of _____, _____, the name and corporate seal of each corporate party being hereto affixed and these present signed by its undersigned representative, pursuant to authority of its governing body.

1. Forms of Bid Bonds prepared to meet the requirements of local or State laws or the needs of the Grantee/Local Public Agency should be substituted for this form where necessary.

_____ (SEAL)

_____ (SEAL)

Attest: _____ By: _____

Attest: _____ By: _____ Corporate Seal
_____ Affix

By: _____ Corporate Seal
Affix

Countersigned by _____

2. Attorney-in-Fact, State of _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the _____,
_____, Secretary of the Corporation named as Principal in the within bond; that
_____, who signed the said bond on behalf of the Principal was then
_____ of said corporation; that I know his signature, and his signature
thereto is genuine; and that said bond was duly signed, sealed, and attested to for and in behalf of said
corporation by authority of this governing body.

Title _____ Corporate Seal

2. Power-of-attorney for person signing for surety company must be attached to _____ bond.

SECTION 00 7200

GENERAL CONDITIONS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 GENERAL CONDITIONS

- 1.2.1 The General Conditions which shall become a part of the agreement will be the General Conditions of the Contract for Construction, Construction Manager as Adviser Edition, AIA Document A232-2009.
- 1.2.2 A sample copy of the General Conditions can be viewed or downloaded at: www.rchendrick.com. Click on "Plan Room" and then click on the link "Specification Forms."

END OF SECTION 00 7200

SECTION 00 7300

SUPPLEMENTARY CONDITIONS

GENERAL CONDITIONS

1. The General Conditions of this contract are the American Institute of Architects Standard Document A232-2009, titled "General Conditions of the Contract for Construction, Construction Manager as Adviser Edition." This document is hereby made part of the Contract Documents.
2. The following supplements modify AIA Document A232-2009, General Conditions of the Contract for Construction, Construction Manager as Adviser Edition. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 2 – OWNER

1. Delete subparagraph 2.2.5 and substitute:
2.2.5 – The Contractor will be furnished, subject to a deposit, all copies of drawings and specifications reasonably necessary for execution of the work as determined by the Construction Manager.

ARTICLE 3 – CONTRACTOR

1. Add Section 3.4.2.1 to Section 3.4.2:
3.4.2.1 After the Contract has been executed, the Owner, Construction Manager and Architect will consider requests for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications).
By making requests for substitutions, the Contractor:
 - .1 represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
 - .2 represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
 - .3 certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be changed as a result of the substitution, except for the Architect's redesign costs, and waives all claims for additional costs related to the substitution that subsequently become apparent; and
 - .4 shall coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
2. Delete subparagraph 3.4.3 and substitute:
3.4.3 The Contractor shall at all times enforce strict discipline and good order among the Contractor's employees and any subcontractor employed by the contractor and shall not employ on the work any unfit person or anyone not skilled in the task assigned to them.
3. Add subparagraph 3.7.6

3.7.6 Regarding OSHA fines: The Contractor for any fines incurred as a result of the Contractor shall reimburse the Construction Manager for similar fines against the Construction Manager.

4. Add subparagraph 3.9.4

3.9.4 The Construction Manager reserves the right to cause the replacement of the superintendent, assistant superintendent or employee of the contractor who is not qualified, in the opinion of the Construction Manager to do the work.

ARTICLE 5 – SUBCONTRACTORS

1. RE: Subparagraphs 5.2.1, 5.2.2, 5.2.3, and 5.2.4.
Delete the words, “the Construction Manager or Architect” and insert the words, “the Construction Manager and Architect.”

ARTICLE 7 – CHANGES IN THE WORK

1. Add Subparagraph 7.1.4
7.1.4 The maximum allowable markup on Changes in the Work shall be eleven percent (11%) which includes overhead, profit, estimating expenses, other office expense, bond and insurance costs.”
2. RE: Subparagraph 7.3.7
Delete the words, “the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount.” and insert the words, “Section 7.1.4.”

ARTICLE 8 – TIME

1. Add subparagraph 8.3.4
8.3.4 Claims for Delay: In the event the contractor is delayed in completing the work by the Owner for any reason, whether intentional or otherwise, and the delay does not preclude the contractor from completing the work within the time period specified in the contract agreement, the contractor shall be entitled to no remedy for such delay.

ARTICLE 9 – PAYMENTS AND COMPLETION

1. Add subparagraph 9.3.1.3
9.3.1.3 Up to time the work is substantially complete, the owner will make monthly payments to the contractor, based on the schedule of values of 90% of the value of labor and materials incorporated in the work and of 90% of all tangible materials stored at the site during that month. The Owner will have retained five percent (5%) of the total contract price for “Closeout Materials” and five (5%) of the total contract price for “Punch List Completion”. The Contractor may request payment of the retained percentages upon completion of that portion of their Work.
2. Add subparagraph 9.3.1.4
9.3.1.4 Deliver estimates to the Construction Manager for approval as agreed upon. The form of application for payment shall be AIA Document G732-2009, notarized by Contractor and supported by AIA Document G703 – Continuation Sheet.
3. Add clause .8 to subparagraph 9.5.1
.8 Unsatisfactory clean-up in accordance with subparagraph 3.15.

ARTICLE 11 – INSURANCE AND BONDS

1. Add the following Sections 11.1.2.1 through 11.1.2.4 to Section 11.1.2:
11.1.2.1 The limits for Worker’s Compensation and Employers’ Liability insurance shall meet statutory limits mandated by State and Federal laws. If (1) limits in excess of those required by statute are to be provided, (2) the employer is not statutorily bound to obtain such insurance coverage, or (3) additional coverages are required, additional coverages and limits for such insurance shall be as follows:

WORKER’S COMPENSATION AND EMPLOYER’S LIABILITY INSURANCE:

Worker’s Compensation:	State of Michigan Statutory Limits
Employer’s Liability:	\$500,000 – each accident \$500,000 – disease (each employee) \$500,000 – disease (policy limit)

11.1.2.2 The limits for Commercial General Liability insurance including coverage for Premises-Operations, Independent Contractors’ Protective, Products-Completed Operations, Contractual Liability, Personal Injury and Broad Form Property Damage (including coverage for Explosion, Collapse, and Underground Hazards) shall be as follows:

COMMERCIAL GENERAL LIABILITY INSURANCE:

Bodily Injury	\$1,000,000 – each occurrence \$2,000,000 – aggregate
Property Damage	\$1,000,000 – each occurrence \$2,000,000 – aggregate
Fire Damage (any one fire)	\$100,000
Medical Expense (any one person)	\$5,000

Notes:

- (1) Products-Completed Operations Insurance shall be maintained for a minimum period of one (1) year after final payment.
- (2) The Owner, Architect and Construction Manager shall be listed as additional insured. The Owner shall be the certificate holder.

11.1.2.3 Automobile Liability insurance (owned, non-owned and hired vehicles) for bodily injury and property damage:

AUTOMOBILE LIABILITY INSURANCE:

Bodily Injury	\$1,000,000
Property Damage	\$1,000,000

11.1.2.4 Umbrella or Excess Liability Coverage:

UMBRELLA / EXCESS LIABILITY INSURANCE:

Umbrella/Excess Insurance	\$2,000,000 – each occurrence \$2,000,000 – aggregate

2. Add Subparagraph 11.3.11

11.3.11 The provisions of this paragraph 11.3 shall not operate to relieve the Contractor of responsibility for loss or damage to the Contractor's own or rented property or property of Contractor's employees of whatever kind or nature, including but not limited to: tools, equipment, forms, scaffolding and temporary structures, including their contents. The Owner shall in no event be liable for loss or damage to the aforementioned items or other property of the contractor that is not included in the permanent construction.

3. Delete Subparagraph 11.3.7 Waivers of Subrogation

ARTICLE 13 – MISCELLANEOUS PROVISIONS

1. Delete subparagraph 13.6 – Interest in its entirety.

END OF SECTION 00 7300

SECTION 00 7316

INSURANCE REQUIREMENTS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 INSURANCE REQUIREMENTS

- 1.2.1 Each contractor shall provide, to the Owner, through the Construction Manager, a certificate of insurance indicating that all required insurance coverage is in effect. This certificate shall be provided before any Work begins.
- 1.2.2 Limits of required insurance are listed in the Supplementary Conditions, Section 00 7300 – Article 11. Contractors are to provide at least the limits stated in that section.
- 1.2.3 The Owner, Architect, and Construction Manager shall be listed as “additional insured” on the insurance certificate.
- 1.2.4 A sample Acord Insurance Certificate with instructions is attached for your use.

1.3 INSURANCE FOR STORED MATERIAL

- 1.3.1 If a Contractor wishes to be paid for stored material that is not presently on the jobsite, they will be required to furnish photographic evidence of the material as well as an insurance certificate for the material.

1.4 BUILDER’S RISK INSURANCE

- 1.4.1 Per the General Conditions, the Owner shall secure and pay for Builder’s Risk Insurance for the Project.

END OF SECTION 00 7316

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	The name and address of the Insurance Company goes here	CONTACT NAME:	
		PHONE (A/C, No, Ext):	FAX (A/C, No):
		E-MAIL ADDRESS:	
		PRODUCER CUSTOMER ID #:	
		INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED	The name and address of the Prime Contractor goes here	INSURER A:	The name(s) of the insurance companies providing coverage
		INSURER B:	
		INSURER C:	
		INSURER D:	
		INSURER E:	
		INSURER F:	

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	GENERAL LIABILITY			Policy Number Must Be Listed Here	Start/End dates of Policy must be listed here		EACH OCCURRENCE \$ 1,000,000
☒	COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 1,000,000
	CLAIMS-MADE ☒ OCCUR						MED EXP (Any one person) \$ 5,000
							PERSONAL & ADV INJURY \$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE \$ 2,000,000
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG \$ 2,000,000
	AUTOMOBILE LIABILITY			Policy Number Must Be Listed Here	Start/End dates of Policy must be listed here		COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
☒	ANY AUTO						BODILY INJURY (Per person) \$
☒	ALL OWNED AUTOS						BODILY INJURY (Per accident) \$
☒	SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident) \$
	HIRED AUTOS						\$
	NON-OWNED AUTOS						\$
☒	UMBRELLA LIAB			Policy Number Must Be Listed Here	Start/End dates of Policy must be listed here		EACH OCCURRENCE \$ 2,000,000
	EXCESS LIAB						AGGREGATE \$ 2,000,000
	DEDUCTIBLE						\$
	RETENTION \$						\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			Policy Number Must Be Listed Here	Start/End dates of Policy must be listed here	☒ WC STATU-TORY LIMITS ☐ OTH-ER	E.L. EACH ACCIDENT \$ 500,000
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	Y / N ☐	N/A				E.L. DISEASE - EA EMPLOYEE \$ 500,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - POLICY LIMIT \$ 500,000

This section does not need to be filled out unless a specific coverage is required

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

List the Owner, Architect and Construction Manager as Additional Insured

CERTIFICATE HOLDER

CANCELLATION

The Owner shall be listed here as the Certificate Holder

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Signature of your authorized insurance agent

SECTION 00 8100

SAFETY REQUIREMENTS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SAFETY NARRATIVE

- 1.2.1 Safety does not start in the field; it takes planning and forethought before field operations even begin. Contractors will require a clear vision of what work activities their respective companies will perform and how to provide a safe work environment for all persons on the site. Each contractor should do a Job Hazard Analysis to determine the safety requirements for their job functions before finalizing their bid. R.C. Hendrick & Son is aware that the success of a safety and health program is contingent and dependent on support and involvement from all employees of the company and all trade contractors. For any construction project to be considered a success, it must be a safe project. Any unsafe acts shall be dealt with and corrected immediately.

R.C. Hendrick reserves the right to remove any worker from the site for improper conduct, poor attitude toward safety or not following requirements in this section.

All personnel on site should be looking out for the safety of anyone on site. If you suspect a worker is engaging in a potentially unsafe activity, all workers have the right to ask the individual if the activity meets their company safety plan or MIOSHA standards and should notify R.C. Hendrick for further action.

1.3 SAFETY REQUIREMENTS

- 1.3.1 Before commencing any work, trade contractors are required to provide a copy of their Accident Prevention Plan (Safety Plan), Respirable Silica Program (if it pertains to your work scope), and the Safety Data Sheets (SDS Documents) for all hazardous materials they will be using on site.
- 1.3.2 All Trade Contractors are required to understand and comply with OSHA, MIOSHA as well as any other agency that has jurisdiction over the Project. **In addition, each Trade Contractor shall be responsible for payment of all fines and/or claims levied against the Owner, Architect or CM/Constructor for deficiencies relating to the Work or Conduct of a Trade Contractor.**

- 1.3.3 Trade Contractors shall also be required to comply with the R.C. Hendrick Company Safety Manual. A copy of the safety manual is available for review at: www.rchendrick.com. Click on “Plan Room” and then click on the link “Specification Forms.”
- 1.3.4 R.C. Hendrick will also create a Site-Specific Safety Manual that is specifically tailored to the Project. Topics in the manual may include Site-Specific Safety Hazards, Emergency Procedures, Nearest Emergency Center, and Important Contact Information. This manual will be completed prior to the start of construction and will be posted at the jobsite and can be made available electronically if requested.
- 1.3.5 Operate machinery and equipment only if properly trained, qualified and authorized to do so.
- 1.3.6 Provide a completed daily inspection report for all rough terrain vehicles, scissor lifts and aerial lifts turned in to the R.C. Hendrick Superintendent.
- 1.3.7 Wear the required personal protective equipment (PPE) for the duties performed.
 - 1.3.7.1 Hard Hat, Safety Glasses, Construction Level Work Boots, High-Visibility Clothing (Outer Layer)
- 1.3.8 Keep work areas safe by exhibiting good housekeeping skills.
- 1.3.9 Report all unsafe work conditions immediately to your foreman, safety representative or the R.C. Hendrick Superintendent.
- 1.3.10 Before starting a work activity, make sure you are ready to perform your job tasks safely, no “short-cuts.” Use the right tool for the task.
- 1.3.11 Do not undertake any activities that would put yourself or anyone else in harm or danger.
- 1.3.12 If a tool or piece of equipment is malfunctioning or shows a defect, remove it from service immediately.
- 1.3.13 Report any injury, illness, property/equipment damage, or near-misses immediately to your foreman, supervisor, or R.C. Hendrick Superintendent.
- 1.3.14 The use of tobacco products, drugs or alcohol is strictly prohibited.
- 1.3.15 Weekly “tool-box-talks” are required and a signed copy should be turned into the R.C. Hendrick Superintendent.
- 1.3.16 R.C. Hendrick’s safety officer or regulatory agencies may periodically inspect the jobsite for safety violations and will report the findings to the project superintendent.

END OF SECTION 008100

SECTION 01 1100

SUMMARY

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes the following:

- A. Work covered by the Contract Documents.
- B. Type of the Contract.
- C. Owner-furnished products.
- D. Use of premises.
- E. Owner's occupancy requirements.
- F. Work restrictions.
- G. Specification formats and conventions.

- 1.2.2 Related Sections include the following:

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- 1.3.1 Project Identification: Port Austin Four Seasons Pavilion

- 1.3.2 Owner: Village of Port Austin

- 1.3.3 Architect: WTA Architects

- 1.3.4 Construction Manager: R.C. Hendrick & Son, Inc.

1.4 TYPE OF CONTRACT

- 1.4.1 Project will be constructed under multiple prime contracts direct with the Owner.

1.5 OWNER-FURNISHED PRODUCTS

- 1.5.1 Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment.

1.6 USE OF PREMISES

- 1.6.1 General: Each Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- 1.6.2 Use of Site: Limit use of premises to areas as directed by Construction Manager. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - A. Owner Occupancy: Allow for Owner occupancy of Project site
 - B. Driveways and Entrances: Keep driveways 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.
 - 1. Schedule deliveries to minimize use of driveways and entrances.
 - 2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- 1.6.3 Use of Existing Building: Maintain existing building in a weather-tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

- 1.7.1 Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
 - A. 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.
 - B. Provide not less than five (5) calendar days' notice to Owner of activities that will affect Owner's operations.

1.8 WORK RESTRICTIONS

- 1.8.1 Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - A. Notify **Owner** not less than ten days in advance of proposed utility interruptions.
 - B. Do not proceed with utility interruptions without **Owner's** written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

1.9.1 Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

- A. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- B. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

1.9.2 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:

- A. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
- B. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - 1. 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.

1.10 MISCELLANEOUS PROVISIONS

- 2. PRODUCTS (Not Used)
- 3. EXECUTION (Not Used)

END OF SECTION 01 1100

SECTION 01 2100

ALLOWANCES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes administrative and procedural requirements governing allowances.
 - A. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- 1.2.2 Types of allowances include the following:
 - A. Lump-sum allowances.
 - B. Contingency allowances.
 - C. Testing and inspecting allowances.
- 1.2.3 Related Sections include, but not limited to the following:
 - A. Division 01 2600 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for changes.
 - B. Division 01 4000 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
 - C. Divisions 02 0000 Sections through 33 0000 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- 1.3.1 At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- 1.3.2 At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

- 1.3.3 Purchase products and systems selected by Architect from the designated supplier.

1.4 SUBMITTALS

- 1.4.1 Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- 1.4.2 Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- 1.4.3 Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

- 1.5.1 Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM ALLOWANCES

- 1.6.1 Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.
- 1.6.2 Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 CONTINGENCY ALLOWANCES

- 1.7.1 Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- 1.7.2 Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- 1.7.3 Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- 1.7.4 At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 TESTING AND INSPECTING ALLOWANCES

- 1.8.1 Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- 1.8.2 The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- 1.8.3 Costs of services not required by the Contract Documents are not included in the allowance.
- 1.8.4 At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 UNUSED MATERIALS

- 1.9.1 Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - A. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

PART 3 EXECUTION

3.1 EXAMINATION

- 3.1.1 Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- 3.2.1 Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

None

END OF SECTION 01 2100

SECTION 01 2200

UNIT PRICES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITION

- A. A Unit price is stated on the Bid Form as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 UNIT PRICES

- A. Unit prices include all necessary material plus cost for delivery, installation, insurance, applicable taxes, overhead and profit.
- B. Refer to individual specification sections for work that requires establishment of Unit Prices. Methods of measurement and payment are specified in those sections.
- B. The Owner or Construction Manager reserve the right to reject contractor's measurement of work-in-place that involves the use of established unit prices and to have this work measured, at the Owner's expense, by an independent firm acceptable to contractor.
- B. Additional Unit Prices may be required following the submission of bids.

PART 3 EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. None

END OF SECTION 01 2200

SECTION 01 23 00

ALTERNATES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes administrative and procedural requirements for alternates as proposed by the Architect.

- A. **Voluntary Alternates or Substitutions proposed by Bidders will not form the Base Bid Proposal Price.**

1.3 DEFINITIONS

- 1.3.1 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.

- A. 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.

- 1.3.2 Voluntary Alternates: Bidders proposed voluntary alternates and substitutions will not be recognized as part of the Base Bid Price opening. Owner may review voluntary proposals with the successful Bidder.

1.4 PROCEDURES

- 1.4.1 Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

- A. 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.

- 1.4.2 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 modifications to alternates.
- 1.4.3 Execute accepted alternates under the same conditions as other work of the Contract.
- 1.4.4 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.

3. EXECUTION

3.1 SCHEDULE OF ALTERNATES

Alternate No. 1: South Façade Windows:

- 1. Base Bid: Furnish and install storefront style clear anodized window system as shown in construction documents.
- 2. Deduct Alternate: Continue adjoining exterior hardi-board construction to bottom eave in lieu of installing windows.

Alternate No. 2: Athletic Rubber Flooring:

- 1. Base Bid: Furnish and install athletic rubber flooring as specified in Vestibule 106, Women's Toilet Room 103 and Men's Toilet Room 104.
- 2. Deduct Alternate: Install sealed concrete floor finish.

END OF SECTION 01 23 00

SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This section specifies administrative and procedural requirements for handling and processing contract modifications.
- 1.2.2 Related Sections
 - A. Section 013300 – “Submittal Procedures”
 - B. Section 010270 – “Application for Payment”

1.3 MINOR CHANGES IN THE WORK

- 1.3.1 Supplemental instructions authorizing minor changes in the work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Construction Manager on AIA form G10/CMA.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- 1.4.1 Owner-Initiated Proposal Requests: Proposed changes in the work that will require adjustment to the Contract Sum or Contract Time will be issued by the Construction Manager, with a detailed description of the proposed change and supplemental or revised drawings and specifications, if necessary.
 - A. These requests will be identified as “BULLETINS.”
 - B. Bulletins issued by the Architect are for information only. Do not consider them as instructions whether to stop work in progress, or to execute the proposed change.
 - C. Unless otherwise indicated in the bulletin, submit to the Construction Manager for Architect and Owner review, the cost necessary to execute the proposed changes. In the proposal:
 - 1. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

2. Indicate applicable taxes, delivery charges, equipment rental, and amount of trade discounts.
3. Include a statement indicating the effect of the proposed change on the Contract Time.
4. Indicate Overhead and Profit amounts.

1.4.2 Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the contract, the Contractor may propose changes by submitting a request to the Construction Manager for a change.

- A. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
- B. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
- C. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- D. Comply with requirements in Section 001000 Part 6.2 "Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

1.4.3 Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests.

1.5 CONSTRUCTION CHANGE DIRECTIVE

1.5.1 When the Owner and Contractor are not in total agreement on the terms of a Change Order Request, the CM may issue a Construction Change Directive (CCD) on AIA Form G714 instructing the Contractor to proceed with a change in the Work for subsequent inclusion in a Change Order.

- A. The CCD will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.

1.5.2 Documentation: Maintain detailed records on a time and material basis of work required by the CCD.

- A. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

- 1.6.1 Upon the Owner's approval of a Change Order Proposal Request, the Construction Manager will issue a Change Order for signatures of the Owner, Architect, CM, and Contractor on AIA Form G732, as provided in the conditions of the Contract.

2. PRODUCTS (Not Applicable)

3. EXECUTION (Not Applicable)

END OF SECTION 01 2600

SECTION 01 2900

PAYMENT APPLICATION PROCEDURES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION

- 1.2.1 Work included: Comply with procedures described in this Section when applying for progress payment and final payment under the Contract.
- 1.2.2 Related Work
 - A. The Contract Sum and the schedule for payments are described in the form of agreement.
 - B. Payments upon Substantial Completion and Completion of the Work are described in the General Conditions and in Section 017000 of these Specifications.

1.3 QUALITY ASSURANCE

- 1.3.1 Prior to start of construction, secure the Construction Manager and Architect/Engineer's approval of the Schedule of Values required to be submitted under Paragraph 9.2 of the General Conditions.
- 1.3.2 During progress of the Work, modify the Schedule of Values as approved by the Construction Manager and Architect/Engineer to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.
- 1.3.3 Base requests for payment on the approved Schedule of Values.

1.4 SUBMITTALS

- 1.4.1 Formal submittal unless otherwise directed by the Construction Manager:
 - A. Make formal submittal of request for payment by filling in the agreed data, by typing, on AIA Document G703, "Application and Certificate for Payment, Construction Manager-Advisor Edition," plus Continuation Sheet(s) G703.
 - B. Sign and notarize the Application and Certificate for Payment.

- C. Submit the original of the Application and Certificate for Payment, plus two identical copies to the Construction Manager. The Application is to be made out to the Owner and mailed/delivered to the Construction Manager.
 - D. The CM will review the formal submittal, and when approved, will sign the Application and Certificate for Payment, will forward to the Architect for signature, and will distribute one fully executed copy to:
 - 1. Contractor
 - 2. Owner
 - 3. Construction Manager File
 - E. The Owner will, upon approval of the Architect/Engineer, disburse directly to the Contractor in accordance with Article 9 of the agreement between Owner and Contractor.
- 2. PRODUCTS (Not Applicable)
 - 3. EXECUTION (Not Applicable)

END OF SECTION 01 2900

SECTION 01 2976

SWORN STATEMENTS AND WAIVERS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes administrative and procedural requirements for sworn statements, partial waivers and full waivers.
- 1.2.2 Sample Sworn Statement and Waivers can be viewed or downloaded at: www.rchendrick.com. Click on "Plan Room" and then click on the link "Specification Forms."
- 1.2.3 No payment will be made without the proper Sworn Statements and applicable Full or Partial Waivers.

1.3 SWORN STATEMENT

- 1.3.1 A signed and notarized Sworn Statement shall be included with each payment application.
- 1.3.2 Sworn Statement shall include all subcontractors and suppliers. List their work description, total contract amount, amounts paid, amounts owing, any retentions held and balances to complete.

1.4 PARTIAL WAIVER

- 1.4.1 Partial waivers must be provided beginning with the second application for payment. Partial waivers must be provided for every payment listed on the previous month's Sworn Statement.

1.5 FULL WAIVER

- 1.5.1 Before a Trade Contractor can receive final payment, they must submit full waivers from all subcontractors and suppliers.

END OF SECTION 01 2976

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

- A. Generals project coordination procedures.
- B. Administrative and supervisory personnel.
- C. Coordination Drawings.
- D. General installation provisions.
- E. Cleaning and protection.
- F. Limitations for use of the site.
- G. Coordination program.

- 1.2.2 Related Section: The following Sections contain requirements that relate to this Section:

- A. Division 01 3100 Section "Project Management and Coordination" for progress meetings, coordination and pre-installation conferences.
- B. Division 01 6000 Section "Product Requirements" for coordinating materials and equipment for general installation.
- C. Division 01 7300 Section "Execution Requirements" for Layout and Measurements, specifies procedures for field engineering services, including establishment of benchmarks and control points.

1.3 COORDINATION

- 1.3.1 Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend upon each other for proper installation, connection, and operation.

- A. Schedule construction operations in the 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.

- B. Coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- C. Make adequate provisions to accommodate items scheduled for later installation.

1.3.2 Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

- A. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

1.3.3 Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

- A. Preparation of schedules.
- B. Installation and removal of temporary facilities.
- C. Delivery and processing of submittals.
- D. Progress meetings.
- E. Project closeout activities.

1.4 LIMITATIONS ON USE OF THE SITE

1.4.1 General: Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements administer allocation of available space equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on the site.

1.5 SUBMITTALS

1.5.1 Coordination Drawings: Prepare coordination drawings for above ceiling work, equipment rooms and other areas where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

- A. Show the relationship of components on separate Shop Drawings.
- B. Indicate required installation sequence.

1.5.2 Staff Names: Within fifteen (15) calendar days of "Notice to Proceed," submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities. List their addresses and telephone numbers.

- A. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

1.5.3 Other Project names, addresses and information:

- A. Lists of sub-contractors and erectors.
- B. List of suppliers and manufacturers.

2. PRODUCTS (Not applicable)

3. EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- 3.1.1 Inspection of Conditions: Require the Installer of each component to inspect both the substrate and conditions under which Work is to be performed. Proceed when unsatisfactory conditions have been corrected.
- 3.1.2 Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction.

3.2 COORDINATION PROGRAM

- 3.2.1 It shall be the responsibility of the Construction Manager/General Contractor to coordinate the equipment room requirements and the above ceiling space requirements of the various subcontractors and to determine that adequate clearance is allowed with respect to their equipment and the building.
- 3.2.2 The Coordination Program shall consist of a series of meetings with all trades involved and the preparation of installation drawings prepared from base drawings produced by the Sheet Metal Subcontractor. The Mechanical, Electrical and Fire Protection Subcontractors shall use the base drawings for producing their individual installation drawing overlays for coordination with other trades.
- 3.2.3 The following sequence shall be followed:
 - A. After the award of contract and prior to construction the Construction Manager/General Contractor will schedule a meeting to introduce the Coordination Program and determine its implication to the progress schedule. Attendees shall include the Construction Manager/General Contractor, Owner's Representative, Architect/Engineer and all subcontractors responsible for work in equipment rooms and in or above the ceilings which includes (but is not limited to) those items below:
 - 1. Recessed lighting fixtures.
 - 2. Plumbing waste, vent and roof drainage.

3. Steam, condensate and all other pitched services.
 4. Ductwork and appurtenances.
 5. Fire protection (sprinkler system).
 6. HVAC piping.
 7. Plumbing, supply and service piping.
 8. Cable tray.
 9. Electrical conduit.
 - (a) The above list, in descending order, is the precedence for space priority. Recessed light fixtures and space for their installation have first priority, plumbing waste, vent and roof drainage has second priority, etc.
- B. The Construction Manager/General Contractor shall confirm that the following have been provided to the Sheet Metal Subcontractor prior to commencing the base drawings:
1. Approved structural steel drawings.
 2. Clearance requirements for plumbing, piping, etc. from the Mechanical Subcontractor.
 3. Clearance requirements for recessed lighting, cable trays, etc. from the Electrical Subcontractor.
 4. Clearance requirements for piping from the Fire Protection Subcontractor.
- C. The Sheet Metal Subcontractor shall prepare and provide the Mechanical, Electrical and Fire Protection Subcontractors with reproducible transparent drawings which shall serve as the base drawings. The base drawings shall show column center lines, interior partition locations, and ceiling heights.
- D. The Sheet Metal Subcontractor, with reference and consideration to the structural, mechanical, electrical, fire protection, and plumbing requirements provided and the reflected ceiling plans, shall draw, to scale (minimum $\frac{1}{4}$ " scale), the proposed ductwork installation showing duct sizes, equipment layouts, and dimensions from column lines and distance from finished floors to bottom of ducts and equipment. In congested areas, the Sheet Metal Subcontractor shall, in addition, prepare drawings in Section view.
- E. The base drawings with ductwork layouts shall be produced in sequence as mandated by the project schedule. The earliest area indicated in the schedule will receive the first effort, etc.
- F. When the base drawings for the earliest scheduled area have been completed (time limitation as determined in the initial coordination meeting), the Sheet Metal Subcontractor shall provide the Construction Manager/General Contractor with one set of mylars for each participant in the effort. Upon receipt of the base drawings from the Construction Manager/General Contractor each participant shall incorporate on the drawings, their proposed installation. Each of the subcontractors proposed installation drawings shall indicate to scale, size, equipment layout, equipment clearance requirements, dimensions from column centerlines and distance from the finish floor to bottom of equipment,

pipng, conduits, etc. The Contract Drawings shall be followed as a general guide for the proposed installation drawings.

G. The major components to be indicated include (but are not limited to):

1. Roof drain leaders.
2. Waste and vent piping.
3. Fire protection piping.
4. Plumbing and lab service piping.
5. HVAC and Mechanical ductwork routing.
6. Electrical conduit and Cable tray runs.
7. Contract ceiling heights and Soffit locations.
8. Access points for access to valves and Dampers.
9. Firewall penetrations.

H. Prior to fabrication of ductwork and within a period of not to exceed two (2) calendar weeks after distribution of the mylars to the individual participants, the Construction Manager/General Contractor will schedule a meeting with the Owner's Representative, the Architect/Engineers and participating Subcontractors at which time areas of conflict shall be resolved through the following process:

1. The transparent tracings shall be overlaid on a light table to identify areas of conflict. All parties shall then cooperate in resolving the conflicts.
2. The Owner's Representative and the Architect/Engineer reserve the right to determine space priority of the Subcontractors in the event of interference between piping, conduits, ducts and equipment of the various Subcontractors.
3. Records of the areas of conflict and the names of the subcontractor who is to make modifications to their drawings shall be kept by the Construction Manager/General Contractor. This record shall be updated on a weekly basis and shall be incorporated into the coordination meeting minutes.
4. Once all areas of conflict are resolved, each participant shall revise their drawings and shall submit for review. After review, ductwork can be fabricated, and installation of work can begin. A permanent record of the agreement shall be entered on each Subcontractors' installation drawings, acknowledged by all participants' by signature in a space provided for this purpose. The Construction Manager/General Contractor shall provide and distribute two graphic copies of each subcontractor's signed installation drawings to all parties involved. Revisions to drawings as a result of the coordination process shall not be considered an extra and will not result in a change to the contract.
5. The above drawings, review and coordination process will be repeated until all areas on the Project have been coordinated.

I. Shop drawings shall be modified through the coordination process to reflect the final resolved locations of equipment prior to submittal for review.

- J. In the event a Subcontractor fails to cooperate in the Coordination Program, he shall be held responsible for all costs incurred for adjustments to the work of others made necessary to accommodate the uncooperative Subcontractor's installations.
- K. When a Change Order request is issued, the affected Subcontractors shall review the Coordination Drawings and bring to the attention of the Construction Manager/General Contractor any revisions necessary to the work of others affected by the Change Order.

3.2.4 At the completion of the project, each subcontractor shall provide the Construction Manager/General Contractor with a reproducible transparent drawing of the installation drawings to be forwarded to the Owner.

3.3 CLEANING AND PROTECTION

3.3.1 Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

3.3.2 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.

3.3.3 Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

- A. Excessive static or dynamic loading.
- B. Excessive internal or external pressures.
- C. Excessively high or low temperatures.
- D. Thermal shock.
- E. Excessively high or low humidity.
- F. Air contamination or pollution.
- G. Water or ice.
- H. Solvents.
- I. Chemicals.
- J. Radiation.
- K. Puncture.
- L. Abrasion.
- M. Heavy traffic.
- N. Soiling, staining and corrosion.
- O. Bacteria.
- P. Rodent and insect infestation.
- Q. Electrical current.
- R. Improper lubrication.
- S. Unusual wear or other misuse.
- T. Contact between incompatible materials.

- U. Misalignment.
- V. Excessive weathering.
- W. Unprotected storage.
- X. Improper shipping or handling.
- Y. Theft.
- Z. Vandalism.

END OF SECTION 01 3100

SECTION 01 3119

PROJECT MEETINGS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section specifies administrative and procedural requirements for project meeting, including but not limited to: Pre-Construction Meeting, Pre-Installation Meeting, Coordination Meetings and Progress Meetings

1.3 PRE-CONSTRUCTION MEETING

- 1.3.1 A pre-construction meeting will be held at the Project site, virtually, or other convenient location by the Construction Manager after execution of the Agreement and prior to commencement of the construction activities. The purpose of the meeting shall be to review responsibilities, personnel assignments and schedule.
- 1.3.2 Attendees shall include the Owner, Construction Manager, Architect and their consultants, all Contractors and/or their superintendents, major subcontractors, manufacturers, suppliers, and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- 1.3.3 The meeting may include such topics as: Construction Schedule, Critical Work Sequencing, Designation of Responsible Personnel, Procedures for Processing Field Decisions and Change Orders, Procedures for Processing Applications for Payment, Distribution of Contract Documents, Submittal of Shop Drawings, Product Data and Samples, Preparation of Record Documents, Use of the Premises, Office, Work and Storage Areas, Equipment Deliveries and Priorities, Safety Procedures, First Aid, Security, Housekeeping and Working Hours.

1.4 PRE-INSTALLATION MEETING

- 1.4.1 The Construction Manager may conduct a pre-installation meeting at the site before each construction activity that requires coordination with other construction. If a Pre-Installation Meeting is scheduled, the 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.

- 1.4.2 The purpose of the meeting will be to review the progress of other construction activities in preparation for the particular activity under consideration at each pre-installation conference, including requirements for: Contract Documents, Options, Related Change Orders, Purchases, Deliveries, Shop Drawings, Product Data and Quality Control Samples, Possible Conflicts, Compatibility Problems, Time Schedule, Weather Limitations, Manufacturer's Recommendations, Compatibility of Materials, Acceptability of Substrates, Temporary Facilities, Space and Access Limitations, Governing Regulations, Safety, Inspection and Testing Requirements, Required Performance Results, Recording Requirements, Protection
- 1.4.3 The Construction Manager shall record significant discussions and agreements and disagreements of each conference, along with the approved schedule. The Construction Manager shall distribute the record of the meeting to everyone concerned promptly, including the Owner and Architect. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

- 1.5.1 The Construction Manager will conduct progress meetings at regularly scheduled intervals either at the project site or virtually.
- 1.5.2 In addition to representatives of the Owner, CM, and Architect, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress. Progress Meetings are MANDATORY for those contractors working on site. Contractors working on site shall have a representative attend the meeting. Contractors asked to attend may attend virtually if made available by the CM.
 - A. The Construction Manager reserves the right to delay payment to contractors who fail to attend weekly meetings while on-site.
- 1.5.3 The agenda shall include reviewing minutes of the previous progress meeting, review other items of significance that could affect progress. Other topics may include: Interface Requirements, Time, Sequences, Deliveries, Off-Site Fabrications Problems, Access, Site Utilization, Temporary Facilities and Services, Hours of Work, Hazards and Risks, Housekeeping, Quality and Work Standards, Change Orders and Documentation of Information for Payment Requests.

1.5.4 The meeting will also include a review of the Construction Schedule. Review progress since the last meeting. Determine where each activity is in relation to the Construction Manager'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.

1.5.5 Construction Manager will distribute copies electronically of minutes of the meeting to each party present and to other parties who should have been present. The Construction Manager shall also revise the Construction Schedule after each progress meeting where revisions to the Schedule have been made or recognized and will issue the revised Schedule concurrently with the report of each meeting.

2. PRODUCTS (Not Used)

3. EXECUTION (Not Used)

END OF SECTION 01 3119

SECTION 01 3300

SUBMITTAL PROCEDURES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 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

- 1.2.1 This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

- A. Shop drawings and Samples
- B. Product data submittal procedures.
- C. Shop Drawing and Samples Transmittal Form.
- D. Contract Close-out Deliverables Form.

- 1.2.1 Related Sections include the following:

- A. Division 01 2900 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
- B. Division 01 4000 Section "Quality Requirements" for submitting test and inspection reports.
- C. Division 01 7700 Section "Closeout Procedures" for submitting warranties.
- D. Division 01 7700 Section "Closeout Procedures" for submitting Record Drawings, Record Specifications, and Record Product Data.
- E. Division 01 7700 Section "Closeout Procedures" for submitting operation and maintenance manual.
- F. Division 01 7700 Section "Closeout Procedures" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
- G. Divisions 02 0000 through 33 0000 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- 1.3.1 Action Submittals (Shop Drawings, Samples, Product Data, Catalog Cuts, etc.): Written and graphic information that requires Architect's and Construction Manager's responsive action.

- 1.3.2 Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- 1.4.1 General: All submittals shall be transmitted to the Architect, through the Construction Manager, in electronic (PDF) format using Buildingblok. Buildingblok is a website service designed specifically for transmitting submittals between construction team members.
- A. The Buildingblok system will be set up, monitored and administered by the Construction Manager. All subcontractors with an Owner/Contractor Agreement will be required to utilize and comply with the system.
 - B. All contractors will be required to have internet access at your main office and shall provide an email address that will be used for all correspondence with Buildingblok. Contractors shall also utilize Adobe Acrobat, Bluebeam PDF Revu or similar PDF software in order to markup documents and/or apply stamps.
- 1.4.2 Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- A. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - B. 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.
 - 1. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- 1.4.3 Submittals Schedule: Buildingblok will create a schedule of submittals for each specification section. Contractors will be required to upload electronic submittals directly to the site and should immediately notify the Construction Manager if an item is missing from the schedule.
- 1.4.4 Structural steel shop drawings: Prior to the submittal of shop drawings, Pre-submittal Drawings shall be submitted – refer to spec section 05 1200 Structural Steel Framing. The architect and structural engineer will review the Pre-submittal Drawings to clarify the design intent of the Construction Documents and provide additional information as required.

- 1.4.5 Processing Time: Allow enough 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.
- A. Initial Review: Allow ten (10) calendar 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.
 - B. Resubmittal Review: Allow ten (10) calendar days for review of each resubmittal.
 - C. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow fifteen (15) calendar days for initial review of each submittal.
 - D. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fifteen (15) calendar days for review of each submittal. Submittal will be returned to Construction Manager, through the Architect, before being returned to Contractor.
- 1.4.6 Submission of Samples: Physical samples shall be mailed or delivered to the Construction Manager. A transmittal form shall also be submitted on the Buildingblok system for markup, approval and records. A minimum of (3) three physical samples are required and all copies may be kept by the Owner, Architect and Construction Manager.
- 1.4.7 Identification: All submittals shall be accompanied by a transmittal which is attached to the end of this specification section. This transmittal must be filled out completely and it is to be either attached to your electronic submittal or as a separate document in the case of samples submission.
- 1.4.8 Deviations: Highlight and encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- 1.4.9 Additional Physical Copies: The Owner, Architect, or Construction Manager may require a physical copy of the electronic submittal and that will be provided at the submitting contractor's expense.
- 1.4.11 Resubmittals: Resubmittals should be submitted through the Buildingblok system. Resubmit submittals until they are approved by the Architect.
- 1.4.12 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.

- 1.4.13 Use for Construction: Use only final submittals with the Architect's approved or reviewed stamp. DO NOT USE Shop Drawings that are noted to be revised or resubmitted for construction or fabrication.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- 1.5.1 General: At Contractor's written request, copies of Architect's CAD files may be provided to Contractor for Contractor's use in connection with Project. The Architect may require a payment or fee for use of CAD Drawings.

PART 2 PRODUCTS

2.1 ACTION SUBMITTALS

- 2.1.1 General: Prepare and submit Action Submittals required by individual Specification Sections.

- A. All Action Submittals should be electronically uploaded to Buildingblok.
- B. Submit physical Samples direct to the Construction Manager. Include a transmittal on Buildingblok.

- 2.1.2 Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

- A. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
- B. Mark each copy of each submittal to show which products and options are applicable.
- C. Include the following information, as applicable:
 - 1. Manufacturer's written recommendations.
 - 2. Manufacturer's product specifications.
 - 3. Manufacturer's installation instructions.
 - 4. Standard color charts.
 - 5. Manufacturer's catalog cuts.
 - 6. Wiring diagrams showing factory-installed wiring.
 - 7. Printed performance curves.
 - 8. Operational range diagrams.
 - 9. Mill reports.
 - 10. Standard product operating and maintenance manuals.
 - 11. Compliance with specified referenced standards.
 - 12. Testing by recognized testing agency.
 - 13. Application of testing agency labels and seals.
 - 14. Notation of coordination requirements.
- D. Submit Product Data concurrent with Samples.
- E. Number of Copies: Submit copies as indicated in Part 1.4 "Submittal Procedures".

2.1.3 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.

- A. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - 1. Dimensions.
 - 2. Identification of products.
 - 3. Fabrication and installation drawings.
 - 4. Roughing-in and setting diagrams.
 - 5. Wiring diagrams showing field-installed wiring, power, signal, and control wiring.
 - 6. Shop work manufacturing instructions.
 - 7. Templates and patterns.
 - 8. Schedules.
 - 9. Design calculations.
 - 10. Compliance with specified standards.
 - 11. Notation of coordination requirements.
 - 12. Notation of dimensions established by field measurement.
 - 13. Relationship to adjoining construction clearly indicated.
 - 14. Seal and signature of professional engineer if specified.
 - 15. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- B. 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 24 by 36 inches.

2.1.4 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.

- A. Transmit samples that contain multiple, related components such as accessories together in one submittal package.
- B. Identification: Attach label on unexposed side of Samples that includes the following:
 - 1. Generic description of Sample.
 - 2. Product name and name of manufacturer.
 - 3. Sample source.
 - 4. Number and title of appropriate Specification Section.
- C. 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.

1. 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.
 2. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- D. 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.
1. Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
- E. 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.
1. Number of Samples: Submit number of samples as indicated in Part 1.4 "Submittal Procedures".
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - b. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- 2.1.5 Product Schedule or List: 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:
- A. Type of product. Include unique identifier for each product.
 - B. Room name, room number, space and location.
- 2.1.6 Application for Payment: Comply with requirements specified in Division 01 Section "Payment Application Procedures."

- 2.1.7 Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Application Procedures."
- 2.1.8 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. Include the following information in tabular form:
 - A. Name, address, and telephone number of entity performing subcontract or supplying products.
 - B. Number and title of related Specification Section(s) covered by subcontract.
 - C. Drawing number and detail references, as appropriate, covered by subcontract.
 - D. Number of Copies: Submit two (2) copies of subcontractor list, unless otherwise indicated.

2.2 INFORMATIONAL SUBMITTALS

- 2.2.1 General: Prepare and submit Informational Submittals required by other Specification Sections. If required, these submittals should be electronic and uploaded directly to Buildingblok.
 - A. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.
 - B. Certificates and Certifications: Provide a notarized 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.
 - C. Test and Inspection Reports: Comply with requirements in Division 01 4000 Section "Quality Requirements."
- 2.2.2 Coordination Drawings: Comply with requirements specified in Division 01 3100 Section "Project Management and Coordination."
- 2.2.3 Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- 2.2.4 Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- 2.2.5 Installer Certificates: Prepare 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.
- 2.2.6 Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- 2.2.7 Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- 2.2.8 Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- 2.2.9 Material Test Reports: Prepare 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.
- 2.2.10 Product Test Reports: Prepare written reports indicating 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.
- 2.2.11 Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - A. Name of evaluation organization.
 - B. Date of evaluation.
 - C. Time period when report is in effect.
 - D. Product and manufacturers' names.
 - E. Description of product.
 - F. Test procedures and results.
 - G. Limitations of use.
- 2.2.12 Schedule of Tests and Inspections: Comply with requirements specified in Division 01 4000 Section "Quality Requirements."
- 2.2.13 Preconstruction Test Reports: Prepare 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.
- 2.2.14 Compatibility Test Reports: Prepare 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.

- 2.2.15 Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
- 2.2.16 Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 7700 Section "Closeout Procedures" for Operation and Maintenance Data."
- 2.2.17 Design Data: Prepare 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.
- 2.2.18 Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - A. Preparation of substrates.
 - B. Required substrate tolerances.
 - C. Sequence of installation or erection.
 - D. Required installation tolerances.
 - E. Required adjustments.
 - F. Recommendations for cleaning and protection.
- 2.2.19 Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - A. Name, address, and telephone number of factory-authorized service representative making report.
 - B. Statement on condition of substrates and their acceptability for installation of product.
 - C. Statement that products at Project site comply with requirements.
 - D. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - E. Results of operational and other tests and a statement of whether observed performance complies with requirements.

- F. Statement whether conditions, products, and installation will affect warranty.
- G. Other required items indicated in individual Specification Sections.

2.2.20 Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles and term of the coverage.

2.2.21 Safety Data Sheets (SDS): Submit information directly to Construction Manager; do not submit to Architect, except as required in "Action Submittals" Article."

- A. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

2.3.1 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.

- A. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

2.3.2 Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three (3) copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

- A. 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

3.1.1 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 Contractor's review approval stamp before submitting to Architect.

3.1.2 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 AND CONSTRUCTION MANAGER'S ACTION

- 3.2.1 General: Architect will not review submittals that do not bear Construction Manager's or General Contractor's review approval stamp and will return them without action.
- 3.2.2 Action Submittals: Architect and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action to be taken.
- 3.2.3 Informational Submittals: Architect will review each submittal and will return it to the Construction Manager or General Contractor with review comments for their review.
- 3.2.4 Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

END OF SECTION 01 3300

SECTION 01 45 16.01
CONCRETE TESTING

PART 1 - GENERAL

1.01 Work Included

This work includes requirements for concrete, concrete submittals, and testing.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ACI PRC-211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- B. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
- C. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- D. ASTM C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- E. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
- F. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete
- G. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- H. ASTM C595 – Standard Specification for Blended Hydraulic Cements
- I. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- J. ASTM C1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
- K. ASTM C1293 – Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
- L. ASTM C1567 – Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
- M. ASTM E29 – Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- N. Michigan Department of Transportation 2020 Standard Specifications for Construction
- O. Michigan Test Methods (MTM)
- P. Michigan Department of Transportation Qualified Products List

- Q. All references to “Engineer” in this specification shall be interpreted as “Owner”. Owner will determine the involvement of the Engineer during construction.

1.03 Related Work

- A. Section 32 13 00 – Concrete Curb and Gutter, Sidewalk, and Miscellaneous Pavement

1.04 Submittals

- A. Prior to beginning construction, the Contractor shall submit the name and plant location of the proposed NRMCA certified concrete supplier for the project.
- B. Prior to beginning construction, the Contractor shall submit mix designs for the proposed concrete mixtures proposed for use on the project for the Engineer to review.

1.05 Quality Assurance and Quality Control

- A. The Owner will be responsible for Quality Control and Quality Assurance Testing.
- B. Concrete Testing
1. The temperature of concrete will be determined in accordance with ASTM C1064.
 2. Samples of concrete for testing will be obtained in accordance with ASTM C172.
 3. The slump of concrete will be determined in accordance with ASTM C143.
 4. The air content of concrete will be measured in accordance with ASTM C231.
 5. Concrete cylinders for compressive testing will be made in accordance with ASTM C31. The Engineer and Contractor shall use the same size cylinder for test specimens. Four-inch cylinders are preferred, as allowed by ASTM C31.
 6. The compressive strength of concrete will be determined in accordance with ASTM C39.

PART 2 - PRODUCTS

2.01 Mix Design and Documentation

Design concrete mixtures shall meet the requirements specified in Table 1. The Contractor shall provide the grade of concrete for the section number reference application specified in Table 1, or as specified in the contract. The Contractor shall submit a request variance, in writing, when proposing a mix design that exhibits temperature, slump, or air content other than those specified. This submittal shall include the proposed mix design, Job Mix Formula (JMF), and associated trial batch verification test data. Do not use a grade of concrete with a lower specification limit (LSL) 28-day compressive strength less than what is designated for the application.

Blended cement meeting the requirements of ASTM C595 Type IL is permitted.

Secure prior approval from the Engineer to use concrete intended for early opening to traffic to facilitate driveway gaps or other features necessary for required local access.

Unless otherwise specified in the contract, set accelerating admixtures are prohibited.

Unless otherwise specified in the contract, do not exceed 40 percent replacement of the Portland cement in the concrete mixture with slag cement (Grade 100 minimum) or fly ash. Do not exceed 40 percent total replacement of the Portland cement if both slag cement and fly ash are used in the concrete mixture.

Use the combined weight of all cementitious materials to determine compliance with the maximum water-cementitious ratio and cementitious material content requirements specified in Table 1.

Table 1: Minimum Mix Design Requirements for Concrete					
		Concrete Grade			
		3,000	3,500	4,000	4,500
Compressive strength (psi)	7-day	2,200	2,600	3,000	3,200
	28-day	3,000	3,500	4,000	4,500
	70%	2,100	2,450	2,800	3,150
Flexural Strength (psi)	7-day	500	550	600	625
	28-day	600	650	700	750
	70%	420	455	490	525
Slump (inch)		(c)-(f)	(c)-(k)	(l)-(n)	(d)-(f)
Cementitious material content (lb/cyd)		489-517	517-611 (o)	517-611	517-658
Class of coarse aggregate		(p)-(r)			
Maximum w/cm ratio		0.45			
Air content range		5.5-8.5%			

- a. Reserved for future use.
- b. Reserved for future use.
- c. 0- to 3-inch slump for mixtures for pavements.
- d. 0- to 3-inch slump without admixtures or with Type A or D admixture.
- e. 0- to 6-inch slump after the addition of Type MR admixture.
- f. 0- to 7-inch slump after the addition of Type F or G admixture.
- g. 3- to 7-inch slump for tremie applications without admixture or with Type A or D admixture.
- h. 3- to 7-inch slump for tremie applications after the addition of Type MR admixture.
- i. 3- to 8-inch slump for tremie applications after the addition of Type F or G admixture.
- j. 6- to 8-inch slump for dry placed drilled shafts.
- k. 7- to 9-inch slump for wet placed drilled shafts.
- l. 3- to 5-inch slump without admixtures or with Type A or D admixture.
- m. 3- to 6-inch slump after the addition of Type MR admixture.
- n. 3- to 7-inch slump after the addition of Type F or G admixture.
- o. For concrete pavement repair mixtures, use 658 lb/cyd of cement when the weather is forecast to be above 50 degrees Fahrenheit or 752 lb/cyd when the weather is forecast to be 50 degrees Fahrenheit or below.
- p. Use aggregates only from geologically natural sources for pavement, shoulder, miscellaneous pavement (including ramps), concrete pavement overlay, bridge approach slab, structural concrete, drilled shaft, bridge railing, and bridge sidewalk applications.

- q. Unless otherwise required, use Coarse Aggregate 6AA or 17A for exposed structural concrete in bridges, retaining walls, and pump stations.
- r. The flexural and compressive strengths are not part of the specifications but are listed for informational purposes only and are the minimum strengths anticipated for the mix proportions specified for the various grades of concrete when cured under standard conditions.

A. Alkali-Silica Reactivity

Provide documentation to the Engineer that the concrete mixture does not present the potential for excessive expansion caused by alkali-silica reactivity (ASR). Provide current ASR test results (valid for two years from completion of testing), for the fine aggregate that is proposed to be used in the concrete from an independent testing laboratory proficient in ASR testing. The independent testing laboratory must certify, in writing, that all testing was conducted in accordance with the designated standard test procedures described herein. Test results must conform to the specified criterion for one of the following standard test methods. Use the Rounding Method described in ASTM E29 when determining significant digits for reporting expansion test results.

1. Method 1 – ASTM C1260 Mortar Bar Test

If the expansion of the mortar bars is less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.

2. Method 2 – ASTM C1293 Concrete Prism Test

- a. If the expansion of concrete prisms is not greater than 0.040 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered non-deleterious to ASR and may be used in the concrete without the need for ASR mitigation.
- b. If the expansion of concrete prisms is greater than 0.040 percent, but not exceeding 0.120 percent (rounded to the nearest 0.001 percent) after 1 year, the fine aggregate is considered moderately deleterious to ASR and mitigation is required, as follows. A low-alkali cement with Na_2O equivalent alkalies ($\text{Na}_2\text{O} + 0.658 \times \text{percent K}_2\text{O}$) not exceeding 0.60 percent must be used in the concrete mixture to mitigate the potential for ASR. Slag cement or fly ash may be used in conjunction with the low-alkali cement. The total alkali content for the cementitious materials combination must not exceed 3 pounds per cubic yard of Na_2O equivalent.

3. Method 3 – ASTM C1567 Accelerated Mortar Bar Test

If no previous test data are available for the fine aggregate that shows it is resistant to ASR using either Method 1 or 2 above, replace 25 percent to 40 percent of the Portland cement in the concrete mixture with slag cement (Grade 100 minimum) or fly ash. A blended cement meeting the requirements of ASTM C595 containing Portland cement and slag cement or fly ash may also be used.

Demonstrate the ability of the fly ash or slag cement to control the deleterious expansion caused by ASR by molding and testing mortar bars according to the standard test method described in ASTM C1567, using the mix proportions and constituent sources for both the aggregates and the cementitious materials that will be used for the project. Make at least three test specimens for each cementitious materials-aggregate combination. If the

average of 3 mortar bars for a given cementitious materials-aggregate combination produces an expansion less than 0.10 percent (rounded to the nearest 0.01 percent) at 14 days of immersion, the JMF associated with that combination will be considered non-deleterious to ASR. If the average expansion is 0.10 percent (rounded to the nearest 0.01 percent) or greater, the JMF associated with that combination will be considered not sufficient to control the deleterious expansion caused by ASR and the JMF will be rejected.

The Engineer will not approve the use of the JMF if the expansion exceeds the respective threshold limits for the respective ASTM test method used.

B. Mix Documentation

Provide mix design and accompanying JMFs using the methods of verification included in this specification. Include sufficient information on constituent materials and admixtures, along with trial batch verified physical properties of the fresh concrete, mix proportions per cubic yard for all constituents, and compressive strength test results necessary to allow the Engineer to fully evaluate the expected performance of the concrete mixture.

Submit mix design and JMF; include accompanying documentation. List the source of materials, bulk density (unit weight) of coarse aggregate (rodding procedure or shoveling procedure), absorption of aggregates, relative density (specific gravity) of aggregates, aggregate correction factors, batch weights, and project specific or historical laboratory test data. Include the recorded air content of fresh concrete using the same admixture and cementitious material sources to be used in the production of the concrete for the project. A JMF will be approved only if all of the minimum mix design requirements specified in the contract have been met. Use of the MDOT Job Mix Formula Concrete Field Communication Form (MDOT Form Number 1976) is encouraged.

1. Job Mix Formula

Select proportions for concrete mixtures according to ACI Standard 211.1. The volume (oven-dry-rodded) of coarse aggregate per unit volume of concrete must be 65 percent, minimum.

Four methods of verification of proposed JMF are acceptable.

a. Method 1 – Trial Batches

Verification of JMF is based on trial batches with the same materials and proportions proposed for use on the project. Prepare at least one trial batch for each mix design in sufficient time before starting concrete placement to allow for review, according to subsection 2.01.A of this specification. Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of 3 independent samples. All samples may be taken from a single trial batch for a mix design, provided the trial batch is at least 4 cubic yards in volume. For JMF trial batch verification purposes only, 7-day compressive strength test results which report at least 70 percent of the specified 28-day lower specification limit will be sufficient documentation, in lieu of 28-day compressive strengths. The average of at least two strength test specimens represents one compressive strength sample test result for

each independent sample. Provide the necessary ASR documentation as described in subsection 2.01.A of this specification.

b. Method 2 – Same Mix

Verification of JMF is based on experience with the same mix design, JMF, and the same materials. Provide the results of temperature, slump, density (unit weight), air content of fresh concrete, 28-day compressive strength, and age of concrete at the time of strength testing, for a minimum of 3 independent samples produced within the previous 12 months. The average of at least two strength test specimens represents one compressive strength sample test result for each independent sample. Do not substitute material types or sources, including admixtures or cementitious materials, nor change mix proportions in the JMF. Provide the necessary ASR documentation as described in subsection 2.01.A of this specification.

c. Method 3 – Similar Mix

Verification of JMF is based on requirements described in Method 2 above. Substitution of coarse aggregate source is permitted if the new source is of the same geologic type as the original aggregate, and conforms to the specification requirements for the application. Substitution of fine aggregate is permitted only if the new source has been tested for ASR. Provide the necessary ASR documentation as described in subsection 2.01.A of this specification.

Provide the supporting laboratory trial batch documentation and accompanying calculations showing how the mix proportions in the JMF were adjusted, based on the documented differences in relative density (specific gravity), bulk density (unit weight), and absorption of the substituted aggregate sources, to produce a theoretical yield of 100 percent and the required fresh concrete properties.

d. Method 4 – Annual Verification

At the Engineer's option, verification may be accepted annually for a concrete plant rather than on a project basis provided the sources and proportions of the constituent materials, including cementitious materials and source and types admixtures, do not change. If the project is the continuation of work in progress during the previous construction season and written certification is submitted to the Engineer that materials from the same source and with the same mixture properties are to be used, the Engineer may waive the requirement for annual renewal verification of the JMF for the project. Provide the necessary ASR documentation as described in subsection 2.01.A of this specification.

PART 3 - EXECUTION

3.01 Sampling and Testing

A. The following ASTM test methods will apply.

1. C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

3. C138 – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
4. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
5. C172 – Standard Practice for Sampling Freshly Mixed Concrete
6. C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

B. Sampling

Sampling and testing shall be conducted by the Engineer at a rate determined by the Engineer/Owner during placement of the concrete. The Engineer shall take a random sample at a rate of approximately once per 50 cubic yards, based on the anticipated total quantity of concrete to be placed and site conditions, with a minimum of 1 sampling for each day of production per mix design. The sampling rate may be increased by the Engineer if project conditions warrant increased testing. A minimum of 3 cylinders shall be taken for each test (one 7-day break and two 28-day breaks).

Samples will be taken from the concrete at the location as close to its final placement into the forms or on the grade as practical. If sampling from the discharge of the haul unit, the sample will be taken from approximately the middle $\frac{1}{3}$ of the load.

Samples for acceptance will not be taken at the concrete production facility (batch plant), nor prior to discharge from a concrete pump (excluding tremie seal placement applications).

C. Small Incidental Quantities

1. Reduced Quality Control (QC) for Small Incidental Quantities.

Reduced levels of on-site QC testing for concrete may be considered for small incidental quantities. Unless approved by the Engineer, multiple small incidental quantities, including ones that are placed consecutively throughout the project on the same day, are not eligible for reduced QC consideration if the total plan quantity of concrete for the item exceeds 100 cubic yards. Include details for reduced QC testing and oversight in the approved QC plan in accordance with following:

- a. The small incidental quantity of concrete will be limited to a single day's concrete placement of a maximum 20 cubic yards;
- b. The small incidental quantity of concrete is not an integral part of a structural load-bearing element;
- c. The Engineer has received written certification from the Contractor that the concrete supplier has a current QC plan in place and available for review upon request by the Engineer;
- d. The concrete supplier employs an MCA-certified Michigan Concrete Technician Level II available at the plant or on call during concrete placement to validate and authorize modifications to the concrete JMF;
- e. Prior to the first concreting operation, concrete representing the JMF for the small incidental quantity has been sampled and tested by an MCA-certified Michigan

Concrete Technician Level I or Level II to verify that, historically, the JMF produced a concrete mixture meeting the minimum requirements for density (unit weight), slump, air content, and strength. Annual verification may be acceptable provided there are no changes to the material types or sources, including the cementitious materials and admixtures;

- f. The Engineer verifies that the temperature, slump, and air content conform to specification requirements at the start of the day's concreting operation associated with the small incidental quantity; and
 - g. The Engineer is notified a minimum of 24 hours prior to concrete placement.
2. Reduced Quality Assurance (QA) for Small Incidental Quantities.
- At the discretion of the Engineer, daily 28-day compressive strength QA test cylinders for small incidental quantities of concrete may not be required provided QA test cylinders representing the same JMF were sampled and molded at least once during the same week.

3.02 Suspension Limits

If during the pour the concrete is found to be out of the specifications in Table 2, then the pour shall be stopped until concrete can be provided that meets the project specifications. The Engineer will not pay for items placed with concrete that does not meet the following specifications.

Table 2	
Quality Characteristic	Suspension Limits
Air Content (percent)	<5.0 or >9.0
Air Content Loss (percent)	Greater than 1.5
Concrete Temperature (degrees Fahrenheit)	<45 or >90 at time of placement
Slump	See Table 1

3.03 Acceptance

Concrete items will be accepted based on the criteria in the items specification; concrete was placed within the limits of Table 2 and the average of the corresponding 28-day test cylinders being above the design strength.

END OF SECTION

SECTION 01 45 16.02
DENSITY AND AGGREGATE TESTING

PART 1 - GENERAL

1.01 Work Included

This work includes material testing of soil, aggregates, stabilized mixtures, and pulverized pavement mixtures.

1.02 References

- A. Michigan Department of Transportation 2020 Standard Specifications for Construction
- B. Michigan Department of Transportation Density Testing and Inspection Manual
- C. Michigan Department of Transportation Procedures for Aggregate Inspection
- D. Michigan Test Methods (MTM)
- E. All references to "Engineer" in this specification shall be interpreted as "Owner". Owner will determine the involvement of the Engineer during construction.

1.03 Related Work

- A. Section 31 23 01 – Excavating, Filling, and Grading
- B. Section 32 13 00 – Concrete Curb and Gutter, Sidewalk, and Miscellaneous Pavement
- C. Section 32 15 00 – Aggregate Surface
- D. Section 33 44 00 – Storm Sewers

1.04 Quality Assurance and Quality Control

- A. Soil and Aggregate Density Testing
 - 1. The Owner is responsible for all onsite density testing on this project. The Owner has the right to determine which materials shall be tested and the frequency of testing.

- B. Sand and Aggregate Gradation

The Contractor is to supply sand and aggregates in the Michigan Department of Transportation gradations, as specified by the project specifications.

Contractors are encouraged to use "prequalified" Michigan Department of Transportation aggregate sources. If the Contractor elects to use a non-prequalified source, then the Contractor shall be responsible for supplying the Engineer with Sieve Analysis (MTM109) and Loss by Washing (MTM108) at the following rates:

Coarse Aggregates	1 per 1,000 tons
Dense-Graded Aggregates	1 per 1,000 tons
Open-Graded Aggregates	1 per 1,000 tons
Granular Material Class I	1 per 1,000 tons

Granular Material Class II and IIA	1 per 3,000 cubic yards
Granular Material Class III	1 per 10,000 cubic yards
Fine Aggregate	1 per 1,000 tons

All Sieve Analysis and Loss by Washing reports shall be signed and sealed by a Professional Engineer.

1.05 Job Conditions

A. Access for Testing

The Contractor shall provide the Engineer safe access for testing technicians to complete any required testing. Reasonable time for testing shall be allowed by the Contractor.

B. Safety

The Contractor is responsible for conducting operations in a safe and orderly manner and in conformance with MIOSHA P.A. 154.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Minimum Percent of Compaction for Aggregates

The following are a minimum percent compaction for typical items of work. Note: Higher percent compaction may be required for specific items of work, see specifications for those items.

A. Original Ground

Road Embankment Areas	90 percent
Bridges – within the limits as shown on the plans	95 percent

B. Cut Areas

Cuts requiring Sand Subbase	95 percent
Cuts not requiring Sand Subbase	95 percent
Subgrade for HMA Base, Aggregate Base, and Concrete Widening	95 percent
Trenches for under HMA Shoulders	98 percent*

C. Embankments and Backfill

Regular	95 percent* (within top 3 feet)
Abutments with Piling	95 percent
Abutments without Piling	100 percent
Foundation Undercut Backfill	100 percent
Backfill for Bridges, Culverts, Utilities, Manholes, Catch Basins, Edge Drains, and Subgrade Undercuts	95 percent
Foundations and Miscellaneous Structures	95 percent

D. Pavement Structure

Subbase	95 percent*
Subbase for Slope Paving	90 percent
Aggregate Base under Concrete Pavement	95 percent*
Aggregate Base under HMA Pavement	98 percent*
Pulverized HMA Aggregate Base	98 percent
Recycled Concrete Aggregate Base – under Concrete Pavement	95 percent
Recycled Concrete Aggregate Base – under HMA Pavement	98 percent
Aggregate Base – Sleeper Slab and Bridge Approach	98 percent
Shoulders – Class I	98 percent*
Shoulders – Class II, III, and IV	95 percent*
OGDC – used under Concrete and HMA Pavement	95 percent*
OGDC – used under Concrete and HMA Pavement (recycled material)	98 percent*
* May NOT exceed optimum moisture	

3.02 Testing Frequency

Each layer must be tested and meet compaction requirements before the succeeding layer is placed. The Engineer will test at a rate that is warranted for field conditions and Contractor means and methods. The list of frequencies below are minimums.

Subgrade	1 test per 500 feet per width of 24 feet or less
Embankment	1 test per 1,000 cubic yards of material and every lift
Subbase	1 test per 500 feet per width of 24 feet or less
Backfill	1 test per 300 cubic yards of material
Aggregate Base Course	1 test per 500 feet per width of 24 feet or less
Foundations and Miscellaneous Structures	1 test per 1-foot lift or per 300 cubic yards
Trenching	1 test per 1,000 feet each side

3.03 Compaction Efforts

The Contractor shall continue to make compaction efforts to obtain the minimum standards given within this specification upon notification of a failing test. A passing test is required at every location of a failing test prior to starting the next related item of work.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

- A. Temporary utilities, services and facilities will be provided by the Owner through the CM unless otherwise noted or directed by the CM.

- 1. Each Contractor shall provide their own hoisting, loading and unloading.
- 2. Contractors shall arrange for, and schedule, all deliveries during their own normal workday hours.
- 3. **EACH CONTRACTOR IS RESPONSIBLE FOR THEIR OWN WINTER PROTECTION AS IT RELATES TO YOUR SCOPE OF WORK.**

- 1.2.2 Temporary Utilities include, but are not limited to:

- A. Temporary Water Service
 - 1. By Owner
- B. Temporary Electric, Power and Light
 - 1. By Electrical Contractor (utility costs by owner)

- 1.2.3 Temporary Construction and Support Facilities include, but are not limited to:

- A. Temporary Heat – CM will direct contractor to hook up temporary building heat on a Time & Materials basis. The Owner will pay for utility usage.
- B. Field Offices
 - 1. By Each Trade Contractor
- C. Temporary Toilets
 - 1. By Owner

- D. Dumpster
 - 1. By Owner
 - a. **Dumpster is for minor debris only.** No Masonry, Concrete, Pallets or other major items are allowed. CM will back charge contractor for misuse of Dumpster.
 - b. Cleanup is the responsibility of each Bid Category. If necessary, CM will cleanup and back charge contractors accordingly (Refer to Section 017100).

E. Temporary Enclosures

- 1. Temporary Supports
 - a. All Bid Categories shall include all costs necessary to brace their work as required per MIOSHA to maintain progress. This is required for the duration of the project.
- 2. Temporary Partitions
 - a. By T&M unless shown on plans.
- 3. Building Enclosures (Not shown on plans) on a T&M basis.
 - a. By General Trades Contractor

1.2.4 Security and protection facilities required include, but are not limited to:

- A. Temporary Fire Protection
 - 1. By General Trades Contractor
- B. Barricades, Warning Lights, Signs, Etc.
 - 1. By Each Trade Contractor per MIOSHA Regulations
- C. Environmental Protection
 - 1. By Each Trade Contractor

1.3 QUALITY ASSURANCE

1.3.1 Regulations: Comply with industry standards and applicable laws and regulation for authorities having jurisdiction including, but not limited to:

- A. Building Code Requirements
- B. Health and Safety Regulations
- C. Utility Company Regulations
- D. Environmental Protection Regulations

1.3.2 Standards: Comply with the following codes and standards:

- A. NFPA Code 241 – “Building Construction and Demolition Operations”

- B. ANSI-A10 Series – “Safety Requirements for Construction and Demolition”
- C. NECA Electrical Design Library – “Temporary Electrical Facilities”

1.3.3 Refer to “Guidelines for Bid Conditions for Temporary Job Utilities and Services,” prepared jointly by AGC and ASC for industry recommendations.

1.3.4 Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

1.3.5 Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certification and permits.

1.4 PROJECT CONDITIONS

1.4.1 When acceptable to the Owner, change over from use of temporary service to use of the permanent service.

1.4.2 Conditions of Use

- A. Keep temporary services and facilities clean and neat in appearance
- B. Operate in a safe and efficient manner
- C. Take necessary fire prevention measures
- D. Do not overload facilities or permit them to interfere with progress
- E. Do not allow hazardous, dangerous, unsanitary conditions or public nuisances to develop or persist on the site.

2. PRODUCTS

2.1 MATERIALS

2.1.1 General – Provide new materials or undamaged previously used materials in serviceable condition.

2.1.2 Lumber and Plywood – For safety barriers, sidewalks, bridges and similar uses, provide minimum $\frac{5}{8}$ " thick exterior plywood.

2.1.3 Tarpaulins – Provide waterproof, fire resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures; provide translucent, nylon, reinforced, laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

2.1.4 Water – Use Potable Water.

2.2 EQUIPMENT

- 2.2.1 Water Hoses – Shall be ¾” heavy-duty, abrasion resistant, flexible, rubber hoses with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shut-off nozzles at hose discharge.
- 2.2.2 Electrical Outlets – Properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment (Refer to Section 16000 – Electrical).
- 2.2.3 Electrical Power Cords – Shall be provided by each Bid Category and shall be ground extension cords. Use “hard-service” cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress.
- 2.2.4 Heating Units – Temporary heating units shall be tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
- 2.2.5 Temporary Offices – Each Contractor shall provide prefabricated or mobile units with lockable entrances, operable windows, and serviceable finishes. Provide heated units on foundations adequate for normal loading. Construction Manager is not responsible for temporary offices, trailers, or the contents inside such trailers.
- 2.2.6 Temporary Toilet Unit – Provided by Owner
- 2.2.7 First Aid Supplies – Each Bid Category Contractor shall comply with governing regulations.
- 2.2.8 Fire Extinguishers – Shall be portable UL-rated, Class “A” fire extinguishers for temporary offices and similar spaces. In other locations, provide portable, UL-rated, Class “ABC” dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposures.
 - A. Comply with NFPA 10 *AND* 241 for classification, extinguishing agent and size required by location and class of fire exposure.

3. EXECUTION

3.1 INSTALLATION

- 3.1.1 Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as directed by the Construction Manager.

- 3.1.2 Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- 3.2.1 Owner will provide permanent power to main transformer pad. As soon as possible, contractors may have to supply portable generators until temporary power is established or during shutdown if required.
 - A. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary service (Refer to Section 16000).
 - B. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services (Refer to Section 16000).
- 3.2.2 Temporary Electric Power Service – Provide a minimum of four receptacles every 1000 square feet or as necessary to provide sufficient power for contractors work.
- 3.2.3 Power Distribution System – Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 volts, AC 20 ampere rating and lighting circuits may be non-metallic sheathed cable where overhead and exposed for surveillance.
- 3.2.4 Temporary Lighting – Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operation and traffic conditions. Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching (Refer to Section 16000). All temporary lighting is to be instant on, instant off.
- 3.2.5 Temporary Telephone – At each telephone, a list of emergency numbers shall be posted. Contractors may use Construction Manager's for emergency purposes only.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- 3.3.1 Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
 - A. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

- B. Each Contractor is responsible for electrical hook-up to their trailers.
 - C. Any electric heaters or Air Conditioners used for heating or cooling will be metered and paid for by that Contractor.
- 3.3.2 Provide incombustible construction for offices, shops, and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
- 3.3.3 Temporary Heat – Provide temporary heat required by construction activities for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- 3.3.4 Heating Facilities – Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
- A. Use of gasoline burning space heaters, open flame or salamander type heating units is prohibited.
 - B. Any electric heaters used for temporary heating will not be approved unless approved in writing before bid date.
- 3.3.5 Mechanical and electrical contractors shall expedite their work so that completed or partially completed permanent heating installation may be used as soon as possible. Requirements for temporary use of these systems are as follows:
- A. Do not use permanent duct system until filter units are installed. Change or clean filters frequently and install new filters at completion. Filters may be cleaned only if they are type intended for cleaning. Clean filters in accordance with manufacturer's directions.
 - B. Thoroughly clean permanent convectors or other permanent space heaters used for temporary heating units. Restore units to original finish at completion of the Work.
 - C. Set permanent space heaters temporarily, if in the judgment of the Construction Manager, use is required to maintain reasonable temperatures and required to properly dry out the building. Automatic devices, permanent or temporary, shall control temperatures in all areas. Thoroughly clean valves and traps installed with the units and adjust just prior to project completion.

- D. The Owner through the CM shall maintain and operate the temporary building heating system and pay for utility usage costs.
- E. Costs for fuel, water and electric power required to operate heating system shall be paid by Owner. Other costs shall be paid by the trade contractor, including costs of providing and installing units, placing and replacing filters, reconditioning units and wages of labor required to operate the system. The Electrical Contractor is to hook up the power to the temporary heaters.

3.3.6 Temporary Lifts and Hoists – All Bid Categories are to provide their own facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

3.3.7 Project and Temporary Signage – The Owner through the Construction Manager will provide all Project and Directional Signage. All Bid Categories must receive approval from the Construction Manager before installing any signage. The CM reserves the right to remove any and all signage from the Project Site.

3.3.8 Temporary Exterior Lighting – Install exterior yard and sign lights so that signs are visible when work is being performed.

3.3.9 Collection and Disposal of Waste – By all Bid Categories as required. Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. ENFORCE REQUIREMENTS STRICTLY. Do not hold materials more than seven days during normal weather or three days when the temperature is expected to rise above 80° Fahrenheit (27° Celsius). Handle hazardous, dangerous or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

3.4.1 Except for use of permanent fire protection, as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as directed by the CM.

3.4.2 Temporary Fire Protection – Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations and Demolition Operations.”

- A. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher for every 100ft. (per MIOSHA Rules and Regulations).

- B. Store combustible materials in containers in fire-safe locations.
 - C. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, egress exits and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 - D. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- 3.4.3 Permanent Fire Protection – At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- 3.4.4 Barricades, Warning Signs and Lights – Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- 3.4.5 Temporary Gates and Fencing – To be maintained, locked and kept secure on a daily basis by Construction Manager. The Trade Contractors are expected to participate in locking the site especially if they are working after-hours.
- 3.4.6 Security Enclosure and Lock-up – Installed and maintained by the Construction Manager.- Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
- 3.4.7 Storage – To be maintained in storage trailers unless approved by Construction Manager. Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lock-up. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- 3.4.8 Environmental Protection – Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways and subsoil must be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons of firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

- 3.5.1 Supervision – Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- 3.5.2 Maintenance – Each Bid Category is required to maintain the temporary facilities that they installed. Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
- 3.5.3 Termination and Removal – Unless the CM requests that it be maintained longer, remove each temporary facility as the need has ended, when 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 the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
 - A. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project Identification Signs.
 - B. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. 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 the temporary entrances, as required by the governing authority.
 - C. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period including but not limited to:
 - 1. Replace air filters and clean inside of ductwork and housings.
 - a. By Mechanical Contractor
 - 2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
 - a. By Mechanical Contractor
 - 3. Replace lamps that are burned out or noticeable dimmed by substantial hours of use. Clean light lenses and diffusers.
 - a. By Electrical Contractor

END OF SECTION 01 5000

SECTION 01 57 26
DUST CONTROL

PART 1 - GENERAL

1.01 Work Included

The Contractor shall provide and maintain adequate measures to control dust from the project area.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ASTM D98 – Standard Specification for Calcium Chloride
- B. Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

- A. Section 31 23 01 – Excavating, Filling, and Grading
- B. Section 31 25 00 – Soil Erosion and Sedimentation Control

PART 2 - PRODUCTS

2.01 Materials

- A. Dust palliative shall be calcium chloride conforming to ASTM D98, except as modified here: Calcium chloride solids shall have a minimum concentration of 77 percent CaCl_2 , and may be of any gradation provided that all particles will pass a $\frac{3}{8}$ -inch sieve, and that less than 5 percent pass a No. 30 sieve. Calcium chloride liquid must be furnished in solution with a concentration of 33, 35, or 38 percent CaCl_2 .

At the time of delivery, the Engineer shall be provided a delivery report with the following information:

1. The volume in gallons or weight of solution delivered, or the weight of solids delivered.
2. The concentration of solids or solution delivered, expressed as the percent of CaCl_2 .
3. The equivalent tons of calcium chloride, CaCl_2 . The equivalent weight of calcium chloride shall be determined in accordance with Table 922-2, of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

PART 3 - EXECUTION

3.01 Requirements for Dust Control Measures

The Contractor shall provide adequate dust control measures to prevent dust from the

construction area from being a health or safety hazard or a nuisance. The Contractor is responsible for control of dust from the construction area, even if the dust is caused by traffic other than the Contractor's operations.

The Contractor shall maintain the dust control measures through the life of the project.

When, in the Engineer's opinion, the Contractor's measures for the control of dust are inadequate, the Engineer will provide notice to the Contractor to take such measures as necessary to control the dust. If the Contractor fails to provide for the required controls, the Engineer may make arrangements for providing dust control measures by another party, and deduct the cost thereof from the Contractor's earnings.

3.02 Application

Water or dust palliative shall be uniformly applied to exposed soil areas which may be the source of dust. The application(s) shall be repeated as necessary to control dust emanating from the project area. If water is used, it shall be applied at a rate to not cause mud to be tracked out of the project limits.

3.03 Measurement

When Dust Palliative is specifically listed on the proposal as a pay item, it will be paid for at the contract unit price, measured by weight of calcium chloride based on the concentration of solids or solution, for the actual quantity of Dust Palliative authorized by the Engineer and applied by the Contractor. A delivery report indicating the concentration of solids or solution delivered shall be provided to the Engineer at the time of delivery.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

- A. Substitutions Request Procedures.
- B. Product Substitutions and Options.

- 1.2.2 Related Sections include the following:

- A. Division 01 7700 Section "Closeout Procedures" for submitting warranties for contract closeout.
- B. Divisions 02 0000 through 33 0000 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- 1.3.1 Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

- A. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
- B. New Products: Items that have not previously been incorporated into another project or facility, **except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise.** Products salvaged or recycled from other projects are not considered new products.
- C. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution,

to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- 1.3.3 Substitutions (after selection of successful bidder): Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- 1.3.4 Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- 1.3.5 Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- 1.3.6 Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- 1.4.1 Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - A. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - B. Form: Tabulate information for each product under the following column headings:
 - 1. Specification Section number and title.
 - 2. Generic name used in the Contract Documents.
 - 3. Proprietary name, model number, and similar designations.
 - 4. Manufacturer's name and address.
 - 5. Supplier's name and address.
 - 6. Installer's name and address.
 - 7. Projected delivery date or time span of delivery period.
 - 8. Identification of items that require early submittal approval for scheduled delivery date.
 - C. Initial Submittal: Within thirty (30) calendar days after date of "Notice to Proceed," or date of commencement of work, submit three (3) copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

1. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - D. Completed List: Within sixty (60) calendar days after date of "Notice to Proceed," submit three (3) copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - E. Architect's Action: Architect will respond in writing to Contractor within fifteen (15) calendar days of receipt of completed product list. Architect's response will include a list of unacceptable product selections without explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
- 1.4.2 Substitution Requests Procedures: Submit three (3) 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.
- A. Substitution Request must be proposed and submitted only to the Construction Manager or General Contractor. Substitution Requests must not be sent directly to the Architect.
 - B. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 1. Statement indicating why specified material or product cannot be provided.
 2. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and other separate Contractors that will be necessary to accommodate proposed substitution.
 3. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 4. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 5. Samples, where applicable or requested.
 6. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 7. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

8. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 9. 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 lack of availability or delays in delivery.
 10. Cost information, including a proposal of change, if any, in the Contract Sum.
 11. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 12. 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.
- C. Architect/Engineer shall have right to reject proposed substitution without explanation.
- D. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within Seven (7) calendar days of receipt of a request for substitution. Architect will notify General Contractor or Construction Manager of acceptance or rejection of proposed substitution within Ten (10) calendar days of receipt of request, or Seven (7) calendar days of receipt of additional information or documentation, whichever is later.
1. **Should the Architect not respond within Twelve (12) calendar days of the dated date of Request, the proposed substitution is considered REJECTED.**
 2. Form of Acceptance: Construction Change Directive (CCD).
 3. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
 4. Owner or Architect does not have to give any reason for rejection of substitutions.

1.4.3 Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 3300 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

1.5.1 Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

- A. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
- B. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

1.6.1 Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

- A. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- B. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- C. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- D. Store products to allow for inspection and measurement of quantity or counting of units.
- E. Store materials in a manner that will not endanger Project structure.
- F. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- G. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- H. Protect stored products from damage.

1.6.2 Owner's Storage Area: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

1.7.1 Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1.7.2 Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

- A. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
- B. Refer to Divisions 02 0000 through Divisions 33 0000 Sections for specific content requirements and particular requirements for submitting special warranties.

1.7.3 Submittal Time: Comply with requirements in the following:

- A. Division 01 3300 Section "Submittal Procedures."
- B. Division 01 7700 Section "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS and SUBSTITUTIONS

2.1.1 General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

- A. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
- B. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- C. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- D. Where products are accompanied by the term "as selected," Architect will make selection.
- E. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
- F. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- G. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product acceptable to the Architect.

2.1.2 Product Selection Procedures: Procedures for product selection include the following:

- A. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 - 1. The product is a single source item.
Substitutions will not be considered.

- B. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 - 1. Substitutions may be considered.
- C. Manufacturer's Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - 1. Substitutions will not be considered.
- D. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - 1. Substitutions by non-listed manufacturers will not be considered.
- E. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by a specified manufacturer. Comply with provisions in "Product Substitutions" Article.
- F. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Product" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, design profiles, dimensions, and other characteristics that are based on the product named.
 - 1. Provide Basis-of Design product or by one of the listed manufacturers.
 - 2. Substitutions of other products will not be considered.
- G. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
 - 1. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

- H. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - 1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - 2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS CRITERIA

- 2.2.1 Timing: Architect may consider requests for substitution if received within thirty (30) calendar days after the "Notice to Proceed" or before the first (1st) "Application for Payment." Requests received after that time may be considered or rejected at discretion of Architect without explanation.
- 2.2.2 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 or reason, 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 affect work of other Trades Contractor's construction time 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.

2.3 COMPARABLE PRODUCTS

2.3.1 Where products or manufacturers are specified by name (except noted as “basis-of-design), submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

- A. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
- B. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
- C. Evidence that proposed product provides specified warranty.
- D. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
- E. Samples, if requested.

END OF SECTION 01 6000

SECTION 01 71 23.16
CONSTRUCTION STAKING BY CONTRACTOR

PART 1 - GENERAL

1.01 Work Included

The Contractor is responsible to provide all staking and layout necessary for construction of the project.

1.02 Notifications

In the event that it appears there is an error or contradiction between plan grades, construction stakes, and/or actual conditions, the Contractor shall notify the Owner immediately.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Requirements

The Contractor is responsible to provide such layout and control work as may be required for construction of the proposed improvements.

The Contractor shall provide workers competent in the layout and control work necessary. The Contractor shall provide the equipment and materials necessary for establishing the necessary control and layout.

Pipelines, 8 inches or larger that are to be laid at a uniform grade, shall be laid using a laser for alignment control.

3.02 Plan Grades and Alignment

The horizontal alignment of manholes and drainage structures will be from the center of casting, unless otherwise noted.

Final casting elevation for drainage structures and manholes shall be determined by the Engineer after grading is completed.

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section includes procedural requirements for cutting and patching of items indicated but not limited to the following:

- A. All Trades Work

- 1.2.2 Related Sections include the following:

- A. Division 2 Section(s) on Selective Demolition
 - B. Division 7 Section(s) on Firestopping

1.3 DEFINITIONS

- 1.3.1 Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- 1.3.2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- 1.4.1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- 1.4.2 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 results that increase maintenance or decreased operational life or safety.
- 1.4.3 Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

- 1.4.4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

1.5 WARRANTY

- 1.5.1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

2. PRODUCTS

2.1 MATERIALS

- 2.1.1 General: Comply with requirements specified in other Sections.
- 2.1.2 In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - A. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

3. EXECUTION

3.1 EXAMINATION

- 3.1.1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - A. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - B. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- 3.2.1 Temporary Support: Provide temporary support of Work to be cut.
- 3.2.2 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.

- 3.2.3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- 3.3.1 General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

- A. 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.

- 3.3.2 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.

- A. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - B. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - C. Proceed with patching after construction operations requiring cutting are complete.

- 3.3.3 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 possible. Provide materials and comply with installation requirements specified in other Sections.

- A. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - B. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 1. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - 2. Restore damaged pipe covering to its original condition.
 - C. 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.

- D. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 1. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - E. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- 3.3.4 Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 7329

SECTION 01 7400

CLEANING AND DEBRIS CONTROL

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 The Construction Manager (CM) reserves the right to act on behalf of the Owner pertaining to the cleaning and debris control responsibilities that are part of each Contractor's Work. The CM shall also be responsible for the following:
 - A. Oversee cleaning and ensure that the building and grounds are kept free from accumulation of waste materials, rubbish, debris, dirt and dust.
 - B. Scheduling exchanges of dumpsters as required.
- 1.2.2 Daily Cleaning
- 1.2.3 Routine Cleaning (Weekly)
- 1.2.4 Final Cleaning

2. PRODUCTS

2.1 SWEEPING COMPOUND

- 2.1.1 Sweeping Compound and/or HEPA vacuums shall be used during any and all sweeping procedures. **All Bid Categories are responsible for supplying their own Sweeping Compound and/or HEPA vacuums.**

3. EXECUTION

3.1 DAILY CLEANING

- 3.1.1 Each Bid Category Contractor shall execute cleaning to ensure that the building and grounds are kept free from accumulation of waste materials, rubbish, debris, dirt and dust.

- A. Daily, during progress of work, each Contractor shall clean site and public properties and dispose of waste materials, debris and rubbish in dumpsters provided by the Construction Manager.
- B. Each Contractor shall handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.
- C. Each Contractor shall provide and maintain garbage cans for the removal of personal trash resulting from breaks and lunches. These are to be emptied on a regular basis.
- D. Each Contractor to maintain cleaning throughout the duration of the Project.

3.2 ROUTINE CLEANING (WEEKLY)

- 3.2.1 On a weekly basis or on a day directed by the Construction Manager, each Contractor shall perform an overall clean-up of the entire site including a broom cleaning of appropriate surfaces. Rubbish and debris shall be removed from the building site to the Owner provided dumpster immediately but no later than the day of weekly cleaning.
 - A. Each Contractor shall use experienced workmen for cleaning, both in the amount required and for the necessary duration, to maintain the building site in a clean condition, as directed by the CM.
 - B. Each Contractor shall remove dirt, mud and other foreign materials from all interior and exterior surfaces.
 - C. Each Contractor to maintain cleaning throughout the duration of the Project.
 - D. Should the contractor fail in the performance of this Work, the Owner may perform such Work in accordance with Article 3 of the General Conditions.

3.3 FINAL CLEANING

- 3.3.1 Final Cleaning will be by Owner.

END OF SECTION 01 7400

SECTION 01 74 50
CLEANUP AND RESTORATION

PART 1 - GENERAL

1.01 Work Included

The Contractor shall restore areas disturbed by construction activities to a condition reasonably close to their condition before the project, unless shown otherwise on the plans. Restoration work should be performed as soon as possible after construction work is completed in a particular area.

Upon the completion of work in an area, all excess materials, debris, equipment, and similar items shall be removed from the project area by the Contractor and disposed of properly.

1.02 Related Work

- A. Section 01 45 16.02 – Density and Aggregate Testing
- B. Section 31 25 00 – Soil Erosion and Sedimentation Control
- C. Section 32 11 23 – Aggregate Base
- D. Section 32 12 16 – HMA Paving
- E. Section 32 13 00 – Concrete Curb and Gutter, Sidewalk, and Miscellaneous Pavement
- F. Section 32 15 00 – Aggregate Surface
- G. Section 32 92 00 – Turf Establishment

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Restoration

Unless otherwise provided, aggregate surfaces, HMA pavements, and concrete pavements shall be restored by construction of similar replacement surfaces. Aggregate surfaces shall be replaced with the materials and thicknesses described in the specification for aggregate surfaces or as shown on the drawings. HMA pavement shall be replaced with the cross section(s) shown on the plans and in accordance with Section 32 12 16 – HMA Paving. Concrete pavement shall be replaced with pavement in accordance with Section 32 13 00 – Concrete Curb and Gutter, Sidewalk, and Miscellaneous Pavement.

Turf areas shall be restored by re-establishing the turf as described in Section 32 92 00 – Turf Establishment. All areas disturbed by construction that are not to be surfaced with aggregate or pavement shall be restored with turf, unless otherwise directed.

Mailboxes, fences, signs, ornaments, and similar items shall be replaced at the completion of

construction. Posts shall be installed plumb. Items that are lost or stolen shall be repaired or replaced at the Contractor's expense. Repairs or replacements shall meet the Owner's approval.

3.02 Temporary Restoration of Driving Surfaces

Where a pavement or gravel surface is removed as a result of construction activities, a temporary surface shall be provided and maintained by the Contractor until the permanent surface is provided. Unless otherwise directed, the temporary surface shall be 8 inches of aggregate compacted according to Section 01 45 16.02 – Density and Aggregate Testing and graded to meet the adjacent, remaining surfaces. Aggregate shall meet the requirements of Series 23A as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction. Recycled HMA may also be utilized after approval of material by the Engineer.

The Contractor shall regrade the temporary surface and add additional aggregate periodically, as necessary, to maintain them in a relatively smooth condition.

END OF SECTION

SECTION 01 7700

PROJECT CLOSEOUT PROCEDURES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 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

- 1.2.1 This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

- A. Substantial Completion and Inspection procedures.
- B. Warranties.
- C. List of incomplete items (punch list).
- D. Project Record Documents.
- E. Operation and maintenance manuals.
- F. Demonstration and Training of Owner's Personnel.
- G. Final Cleaning.

- 1.2.2 Related Sections include, but not limited to the following:

- A. Divisions 02 0000 through Divisions 33 0000 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

- 1.3.1 Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

- A. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
- B. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- C. Utilities. Include occupancy permits, operating certificates, and similar releases.
- D. Prepare and submit Project Record Documents, operation and maintenance manuals.

- E. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
- F. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- G. Complete startup testing of systems.
- H. Submit test/adjust/balance records.
- I. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- J. Advise Owner of changeover in heat and other utilities.
- K. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- L. Complete final cleaning requirements, including touchup painting.
- M. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.3.2 Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Construction Manager 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.

- A. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- B. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 WARRANTIES

- 1.4.1 All materials and installation have a minimum of a 12 month warranty from the date of substantial completion. Additional warranties are specified in the individual specification sections.
- 1.4.2 Submittal Time: 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.
- 1.4.3 Partial Occupancy: Submit properly executed warranties within fifteen (15) calendar 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.
- 1.4.4 Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

- A. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
- B. 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.
- C. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

1.4.5 Provide additional copies of each warranty to include in operation and maintenance manuals.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

1.5.1 Preparation: Submit two (2) copies 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.

- A. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
- B. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
- C. Include the following information at the top of each page:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect and Construction Manager.
 - 4. Name of Contractor.
 - 5. Page number.

1.6 PROJECT RECORD DOCUMENTS

1.6.1 General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.

1.6.2 Record As-Built Drawings: Maintain one (1) and submit one (1) set of black-line white prints of Contract Drawings and Shop Drawings to Architect.

- A. 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 prepare the marked-up Record Prints.

1. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 2. Accurately record information in an understandable drawing technique.
 3. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 4. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
- B. Mark record sets with non-erasable, red-colored ink. Use other colors to distinguish between changes for different categories of the Work at the same location.
- C. Mark important additional information that was either shown schematically or omitted from original Drawings.
- D. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
- E. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

1.6.3 Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

- A. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- B. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
- C. Note related Change Orders, Record Drawings, and Product Data, where applicable.

1.6.4 Record Product Data: Submit one (1) copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

- A. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
- B. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
- C. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

1.6.5 Miscellaneous Record Submittals: 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.

1.7 OPERATION AND MAINTENANCE MANUALS

1.7.1 Assemble and submit one (1) complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

- A. Operation Manuals:
 - 1. Emergency and Standard instructions and procedures.
 - 2. System, subsystem, and equipment descriptions, including operating standards.
 - 3. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - 4. Description of controls and sequence of operations.
 - 5. Piping diagrams.
- B. Emergency Manuals:
 - 1. Types of Emergencies: Fire, Flood, Gas leak, Electrical Power Outage, Chemical, Equipment failure and etc.
 - 2. Instructions and Procedures for Shut-Down and Start-Up.
- C. Maintenance Data:
 - 1. Manufacturer's information, including list of spare parts.
 - 2. Name, address, and telephone number of Installer or supplier.
 - 3. Maintenance procedures.
 - 4. Maintenance and service schedules for preventive and routine maintenance.
 - 5. Maintenance record forms.
 - 6. Sources of spare parts and maintenance materials.
 - 7. Copies of maintenance service agreements.
 - 8. Copies of warranties and bonds.

1.7.2 Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

2. PRODUCTS

2.1 MATERIALS

2.1.1 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.

3. EXECUTION

3.1 DEMONSTRATION AND TRAINING

3.1.1 Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

- A. Provide instructors experienced in operation and maintenance procedures.
- B. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
- C. Schedule training with Owner, through Construction Manager, with at least seven (7) calendar days' advance notice.
- D. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
- E. Submit two (2) copies of instructional and demonstration of training procedures.

3.1.2 Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

- A. System design and operational philosophy.
- B. Review of documentation.
- C. Operations.
- D. Adjustments.
- E. Troubleshooting.
- F. Maintenance.
- G. Repair.

3.2 FINAL CLEANING

3.2.1 General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations and all other governing agencies having jurisdiction on the project.

- A. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project as acceptable to the Architect.
 - 1. 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.
 - 2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove tools, construction equipment, machinery, and surplus material from Project site.
5. 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.
6. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
7. Sweep concrete floors broom clean in unoccupied spaces.
8. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
9. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
10. Remove labels that are not permanent.
11. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
12. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
13. Replace parts subject to unusual operating conditions.
14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
16. Clean ducts, blowers, and coils if units were operated without filters during construction.
17. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
18. Leave Project clean and ready for occupancy.

- 3.2.2 Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 7700

SECTION 01 7836

WARRANTIES

1. GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- 1.2.1 This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

- A. General close-out requirements are included in Section "Project Close-out."
- B. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2-16.
- C. Certifications and other commitments and agreements for continuing services to the Owner are specified elsewhere in the Contract Documents.

- 1.2.2 Disclaimers and Limitations – Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporated the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

- 1.2.3 Separate Contracts – Each Contractor is responsible for warranties related to its own Contract.

1.3 DEFINITIONS

- 1.3.1 STANDARD PRODUCT WARRANTIES are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- 1.3.2 SPECIAL WARRANTIES are written warranties required by or incorporated in the Contract Documents, either to extend the time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

- 1.4.1 Related Damages and Losses – When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of the warranted Work.
- 1.4.2 Reinstatement of Warranty – When Work covered by a warranty has failed and been corrected by replacement or rebuilding; reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- 1.4.3 Replacement Cost – Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- 1.4.4 Owner's Recourse – Written warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
- 1.4.5 Rejection of Warranties – The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- 1.4.6 The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

- 1.5.1 Submit written warranties to the CM prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
- 1.5.2 When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the CM within (15) days of completion of that designated portion of the Work.

- 1.5.3 The Contractor shall submit a letter of warranty to the Owner, through the CM, which guarantees his workmanship for a period of one year from the completion date of the Contract unless otherwise indicated.
- 1.5.4 When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification ready for execution by the required parties. Submit a draft to the Owner through the CM for approval prior to final execution.
- 1.5.5 Form of Submittal – At final completion, compile two copies of each required warranty and bond properly executed by the Contractor, subcontractor, supplier or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents in the Project Manual.
- 1.5.6 Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring vinyl covered, loose-leaf binders thick enough for the contents and available to receive standard sized paper.
 - A. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product and the name, address, and phone of the installer
 - B. Identify each binder on the front and the spine with the typed or printed title “Warranties and Bonds” with the Project Title and name of the Contractor.
- 1.5.7 When Operating and Maintenance Manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1 SCHEDULE OF WARRANTIES

- 3.1.1 Schedule – Provide warranties and bonds on products and installations as specified in the Technical Specification.

END OF SECTION 01 7836

MEDC
GRANTS ADMINISTRATION
COMMUNITY DEVELOPMENT BLOCK GRANT
PROGRAM

CONTRACT SPECIAL PROVISIONS

The following CDBG Contract Special Provisions should be used with all construction contracts, and professional service contracts, where CDBG funds are being used in whole or in part.

CONTRACT SPECIAL PROVISIONS

1. **Definitions:** For purposes of this Contract, the following terms shall have the meanings set forth below:
 - (a) **"Assistance"** means the CDBG grant funds provided, or to be provided, to the Grantee by the State, pursuant to the Grant Award Agreement.
 - (b) **"CDBG"** means Community Development Block Grant.
 - (c) **"Contract"** means the contractual agreement between the Owner and the Contractor to which these Contract Special Provisions have been incorporated and made a part thereof.
 - (d) **"Contractor"** means the contractor whose services are retained pursuant to the Contract.
 - (e) **"Grantee"** means the unit of local government designated as the recipient of the Assistance in the Grant Award and signing the acceptance provision of the Grant Award.
 - (f) **"HUD"** means U.S. Department of Housing and Urban Development, which is the federal agency that awards and has authority over CDBG funding to the State.
 - (g) **"Owner"** means the Grantee or Subrecipient, as applicable.
 - (h) **"Project"** means the project for which the services of the Contractor have been retained pursuant to the Contract which are funded, in whole or in part, with CDBG funds.
 - (i) **"State"** means the State of Michigan, or that agency, agency division, or Office of State government which has been delegated the responsibility for administering the CDBG program for the State of Michigan, as appropriate.
 - (k) **"Labor Surplus Area"** means a civil jurisdiction that has an unemployment rate at least 20% above the average unemployment rate for all states, the District of Columbia, and Puerto Rico during the previous two calendar years. The Department of Labor issues the labor surplus area list on a fiscal year basis.
2. **Prime Contractor Responsibilities:** The Contractor is required to assume sole responsibility for the complete effort and enforcement of laws and regulations under this Contract. The Owner will consider the Contractor to be the sole point of contact with regard to contractual matters. All contractors, including subcontractors must be registered in SAM and eligible to receive federal contracts.
3. **Federal and State Laws:** The Contractor agrees to comply with all CDBG requirements as well as other federal and state laws, regulations, or Executive Orders. The State reserves the right to add or delete terms and conditions of this Contract as may be required by revisions and additions or changes in the requirements, regulations, and laws governing the CDBG Program.

4. **Procurement and Contracting:** In accordance with 2 CFR Part 200, the cost plus a percentage of cost and percentage of construction cost methods of contracting shall not be used. This provision shall supersede any conflicting provision in an executed contract document or agreement funded in whole or in part with CDBG funds.
5. **Ownership:** Ownership of all real or personal property, acquired in whole or in part with CDBG funds for use on this Project, shall be vested in the Grantee, unless otherwise authorized by the State. When the Grantee determines that the property is no longer required for the purposes of this Project, the Grantee must notify the State and obtain approval for disposition of the property in accordance with applicable guidelines.
6. **Copyright:** Except as otherwise provided in the terms and conditions of this Contract, the Contractor paid through this Contract is free to copyright any books, publications or other copyrightable materials developed in the course of the Project and under this Contract. However, HUD and the State reserve a royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use and to authorize others to use, for Federal government and State purposes:

(a) the copyright in any work developed under this Contract; and

(b) any rights of copyright to which a subcontractor purchases ownership with grant support.

The Federal government's rights and the State's rights identified above must be conveyed to the publisher and the language of the publisher's release form must insure the preservation of these rights.

7. **Reporting Requirements:** The Contractor agrees to complete and submit all reports, in such form and according to such schedule, as may be required by the State or HUD. Further, the Contractor agrees to require any subcontractors to submit reports that may be required and to incorporate such language in its agreements. Failure to meet deadlines with the required information could result in sanctions.
8. **Access to Records:** All records with respect to all matters covered by this Contract shall be made available at any time for audit and inspection by HUD, the State or the Grantee or their representatives upon their request.
9. **Maintenance of Records:** Records for non-expendable property purchased totally or partially with Federal funds must be retained for five years after final close-out of the grant. All other pertinent contract records including financial records, supporting documents and statistical records shall be retained for a minimum of five years after the final close-out report. However, if any litigation, claim, or audit is started before the expiration of the five-year period, then records must be retained for five years after the litigation, claim or audit is resolved.
10. **Confidential Information:** Any reports, information, data, etc., given to, prepared by, or assembled by the Contractor under this Contract, which the Grantee or the State requests to be kept confidential, shall not be made available to any individual or organization by the Contractor without prior written approval of the Grantee or the State, as applicable.

11. **Reporting of Fraudulent Activity:** If at any time during the term of this Contract anyone has reason to believe by whatever means that, under this or any other program administered by the State, a recipient of funds has improperly or fraudulently applied for or received benefits, monies or services pursuant to this Contract or any other contract, such information shall be reported immediately to the appropriate authorities.
12. **Political Activity:** None of the funds, materials, property or services provided directly or indirectly under this Contract shall be used for any partisan political activity, or to further the election or defeat of any candidate for public office or otherwise.
13. **Conflicts of Interest and Ethical Standards:** The following provisions regarding “conflicts of interest” apply to the use and expenditure of CDBG funds by the Grantee and its subrecipients, including the Contractor.

In the procurement of supplies, equipment, construction and services, the more restrictive conflict of interest provisions of the State of Michigan Ethics laws, or of the Contractor shall apply.

In cases not governed by the above, such as the acquisition and disposition of real property and the provision of CDBG assistance to individuals, businesses and other private entities, the following provisions shall apply.

Except for eligible administrative or personnel costs, the general rule is that no person who is an employee, agent, consultant, officer, or elected or appointed official of the State or a unit of general local government or any designated public agencies or subrecipient which are receiving CDBG funds who exercise or have exercised any function or responsibilities with respect to CDBG activities assisted herein or are in a position to participate in a decision making process or gain inside information with regard to such activities, may obtain a financial interest or benefit from the activity, or have an interest in any contract, subcontract or agreement with respect thereto, or the proceeds thereunder either for themselves or those with whom they have family or business ties during their tenure or for one year thereafter. Exceptions may be granted by the State on a case by case basis as requested upon full disclosure in writing.

Should any governmental entity, contractor, subcontractor, employee or official know or perceive any breach of ethical standards or conflict of interest under the CDBG grant awarded to the Grantee or any other CDBG grant, they shall immediately notify in writing the MEDC. If the State finds any circumstances that may give rise to a breach of ethical standards or conflict of interest, under any grant, they shall notify the participating governmental entity and the State Ethics Commission as appropriate. The State may undertake any administrative remedies it deems appropriate, where there is a breach of ethical standards or conflict of interest under the regulations governing the CDBG Program and the State policies.

14. **Applicable Law:** In addition to the applicable Federal laws and regulations, this Contract is also made under and shall be construed in accordance with the laws of the State. By execution of this Contract, the Contractor agrees to submit to the jurisdiction of the State for all matters arising or to arise hereunder, including but not limited to performance of said Contract and payment of all licenses and taxes of whatever kind or nature applicable hereto.

15. **Limitation of Liability:** The Contractor will not assert in any legal action by claim or defense, or take the position in any administrative or legal procedures that he is an agent or employee of the Owner. This provision is not applicable to contracts for CDBG administration services where the Contractor is a Council of Government. The State shall not be liable for failure on the part of the Grantee or any other party to perform all work in accordance with all applicable laws and regulations. The Grantee agrees to defend, indemnify, and hold harmless the State from and against all claims, demands, judgments, damages, actions, causes of actions, injuries, administrative orders, consent agreement and orders, liabilities, penalties, costs, and expenses of any kind whatsoever, including, without limitation, claims arising out of loss of life, injury to persons, property, or business or damage to natural resources in connection with the activities of the Grantee and any other third parties in a contractual relationship with the Grantee, or a subsidiary, whether or not occasioned wholly or in part by any condition, accident, or event caused by any act or omission of the State as a result of the Assistance.
16. **Legal Services:** No attorney-at-law shall be engaged through the use of any funds provided under this Contract in any legal action or proceeding against the State, the Grantee, any local public body or any political subdivision.
17. **Contract:** If any provision in this Contract shall be held to be invalid or unenforceable, the remaining portions shall remain in effect. In the event such invalid or unenforceable provision is considered an essential element of this Contract, the parties shall promptly negotiate a replacement provision, which addresses the intent of such provision.
18. **Amendments:** Any changes to this Contract affecting the scope of work of the Project must be approved, in writing, by the Owner and the Contractor and shall be incorporated in writing into this Contract. Any amendments of the original contract must have written approval by the State prior to execution.
19. **Termination for Convenience:** This Contract may be terminated for convenience in accordance with 2 CFR Part 200.
20. **Sanctions:** If the Contractor fails or refuses to comply with the provisions set forth herein, the State or Owner may take any or all of the following actions: cancel, terminate or suspend in whole or in any part the contract, or refrain from extending any further funds to the Contractor until such time as the Contractor is in full compliance.
21. **Subcontracting:** If any part of the work covered by this Contract is to be subcontracted, the Contractor shall identify the subcontracting organization and the contractual arrangements made therewith to the Owner and to the State. All subcontracts must be approved by the Owner and the State to insure they are not debarred or suspended by the Federal or State governments and to insure the Owner and the State understand the arrangements.
22. **Subcontracting with Small and Minority Firms, Women's Business Enterprise and Labor Surplus Areas:** It is national policy to award a fair share of contracts to disadvantaged business enterprises (DBEs), small business enterprises (SBEs), minority business enterprises (MBEs) and women's business enterprises (WBEs). Accordingly, affirmative steps must be taken to assure that DBEs, SBEs, MBEs and WBEs are utilized when possible as sources of supplies, equipment, construction and services. Affirmative steps shall include the following:

- (a) Including qualified DBEs, SBEs, MBEs and WBEs on solicitation lists;
- (b) Assuring that DBEs, SBEs, MBEs and WBEs are solicited whenever they are potential sources;
- (c) Whenever economically feasible, dividing total requirements into smaller tasks or quantities so as to permit maximum participation by DBEs, SBEs, MBEs and WBEs;
- (d) Where the requirement permits, establishing delivery schedules which will encourage participation by DBEs, SBEs, MBEs and WBEs;
- (e) Using the services and assistance of the Small Business Administration, Minority Business Development Agency, the State Office of Small and Minority Business Assistance, the U.S. Department of Commerce and the Community Services Administration as required; and
- (f) Requiring the subcontractor, if any, to take the affirmative actions outlined in (1) – (5) above.

23. **Debarment Certification:** The Contractor must comply with Executive Orders 12549 and 12689 regarding Federal debarment and suspension regulations prior to entering into a financial agreement for any transaction as outlined below.

- (a) Any procurement contract for goods and services, regardless of type, expected to equal or exceed the Federal procurement small purchase threshold (which is \$250,000 and is cumulative amount from all federal funding sources).
- (b) Any procurement contract for goods and services, regardless of amount, under which the Contractor will have a critical influence on or substantive control over the transaction.

In addition, no contract may be awarded to any contractors who are ineligible to receive contracts under any applicable regulations of the State.

24. **Equal Employment Opportunity:** The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the State.

In carrying out the Project, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor must take affirmative action to insure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by the State setting forth the provisions of this non-discrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. The Contractor will, in all solicitations or advertisements for employees by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin. The Contractor shall incorporate the foregoing requirements of this paragraph in all of its subcontracts for

the Project unless exempted by rules, regulations, or orders of the State issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor.

The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the State advising the said labor union or workers' representatives of the Contractor's commitment under this Section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the State, or pursuant thereto, and will permit access to its books, records, and accounts by HUD and the State for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

In the event of the Contractor's noncompliance with the non-discrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further State government contracts or federally assisted construction contract procedures authorized in Executive Order 11246 of September 24, 1965, or by rules, regulations, or orders of the State, or as otherwise provided by law.

25. **Age Discrimination:** In accordance with 45 CFR, Parts 90 and 91, the Contractor agrees there shall be no bias or age discrimination as to benefits and participation under this Contract.
26. **Section 109 of the Housing and Community Development Act of 1974:** No person in the United States shall on the grounds of race, color, national origin or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under the CDBG program of the State.
27. **Section 504 of the Rehabilitation Act of 1973, as amended:** The Contractor agrees that no otherwise qualified individual with disabilities shall, solely by reason of his disability, be denied the benefits, or be subjected to discrimination including discrimination in employment, any program or activity that receives the benefits from the Assistance.
28. **Section 3, Compliance and Provision of Training, Employment and Business Opportunities:** The work to be performed under this Contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, (12 USC § 1701u). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3 shall, to the greatest extent feasible be directed to low and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

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

The contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, if any, a notice advising the organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions; the qualifications for each; and the name and location of person(s) taking applications for each of the positions; and the anticipated date the work shall begin. The Contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The Contractor will not subcontract with any subcontractor where the Contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

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

The Contractor agrees to submit such reports as required to document compliance with 24 CFR Part 135. Noncompliance with the regulations in 24 CFR Part 135 may result in sanctions, termination of this Contract for default, and debarment or suspension from future HUD assisted contracts.

29. **Lead-Based Paint:** The construction or rehabilitation of residential structures with any portion of the Assistance is subject to the HUD Lead-Based Paint regulations found at 24 CFR Part 35. Any grants or loans made by the Grantee for the rehabilitation of residential structures with any portion of the Assistance shall be made subject to the provisions for the elimination of lead-based paint hazards under subpart B of said regulations, and the Grantee shall be responsible for the inspections and certifications required under Section 35.14(f) thereof.
30. **Compliance with Air and Water Acts:** (Applicable to construction contracts and related subcontracts exceeding \$100,000) This Contract is subject to the requirements of the Clean Air Act, as amended, 42 USC § 7401 et seq., the Federal Water Pollution Control Act (Clean Water Act), as amended, 33 USC § 1251 et seq., and the regulations of the Environmental Protection Agency with respect to 40 CFR Part 15, as amended from time to time. In particular, the following are required:
- (a) A stipulation by the Contractor or subcontractor that any facility to be utilized in the performance of any nonexempt contract or subcontract is not listed on the List of Violating Facilities, issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR § 15.20.
 - (b) Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended (42 USC § 7414) and Section 308 of the Federal Water Pollution Control Act, as amended (33 USC § 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Sections 114 and 308, and all regulations and guidelines issued thereunder.

- (c) A stipulation that as a condition of award of contract prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the contract under consideration is to be listed on the EPA list of Violating Facilities.
- (d) Agreement by the Contractor that the Contractor will include or cause to be included the criteria and requirements in these subparagraphs (1) through (4), in every nonexempt subcontract and requiring that the Contractor will take such action as the State may direct as a means of enforcing such provisions.

In no event shall any amount of the Assistance be utilized with respect to a facility which has given rise to a conviction under section 113(c)(1) of the Clean Air Act or Section 309(c) of the Federal Water Pollution Control Act.

31. **Federal Labor Standards Provisions:** *(Applicable to construction contracts in excess of \$2,000 or residential rehabilitation contracts involving more than eight units)*

The Project or program to which the construction work covered by this Contract pertains is being assisted by the United States of America and the Federal Labor Standards Provisions as set forth on Attachment 1 are included in this Contract pursuant to the provisions applicable to such Federal assistance. These provisions must be complied with or sanctions will be instituted.

ATTACHMENT 1

U.S. Department of Housing and Urban Development, Office of Labor Relations form HUD4010 (06/2009)
ref. Handbook 1344.1

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

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

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

- (1)** The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2)** The classification is utilized in the area by the construction industry; and
- (3)** The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment

Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 12150140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1214-0140.)

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

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

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

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

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

(ii) (a) the contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget Under OMB Control Number 1215-0129.)

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

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

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

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

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

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

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

4. Apprentices and Trainees.

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

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every Trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

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

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

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

if its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

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

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

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provided in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

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

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

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

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

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

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

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

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

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

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

Performance Bond-Dual Obligee

**U.S. Department of Housing
and Urban Development**
Office of Housing
Federal Housing Commissioner

OMB Approval No. 2502-0029
(exp. 04/30/2020)

Public reporting burden for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

HUD may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

This information collection is necessary to ensure that viable projects are developed. It is important to obtain information from applicants to assist HUD in determining if nonprofit organizations initially funded continue to have the financial and administrative capacity needed to develop a project and that the project design meets the needs of the residents. The Department will use this information to determine if the project meets statutory requirements with respect to the development and operation of the project, as well as ensuring the continued marketability of the projects. This information is required in order to obtain benefits. This information is considered non-sensitive and no assurance of confidentiality is provided.

Privacy Act Notice: The United States Department of Housing and Urban Development, Federal Housing Administration, is authorized to solicit the information requested in the form by virtue of Title 12, United States Code, Section 1701 et seq., and regulations promulgated thereunder at Title 12, Code of Federal Regulations. While no assurance of confidentiality is pledged to respondents, HUD generally discloses this data only in response to a Freedom of Information Act request.

Know All Men By These Presents, That We,

of

as Principal, (hereinafter called the Principal) and _____, a

as Surety, (hereinafter called the Surety) are held and firmly bound unto _____

Owner, (hereinafter called the "Owner-Obligee") and unto _____,

its successors and assigns, of _____ (hereinafter called the "Lender")

as their respective interests may appear, as OBLIGEES, in the sum of _____

Dollars (\$ _____), lawful money of the United States of America, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has entered into a Construction Contract dated _____
with

Owner-Obligee for the construction of a Housing Project designated as _____

a copy of which Construction Contract is by reference made a part hereof; and

WHEREAS, Lender has agreed to lend to Owner-Obligee a sum of money to be secured by a mortgage on said project and to be used in making payments under said Contract, and desires protection as its interests may appear, in event of default by Principal under said Contract, said protection to be subject to the performance by the Obligees, or either of them, of the obligations to Principal in connection with said Contract.

NOW, THEREFORE, the condition of this obligation is such that, if Principal shall well and truly perform all the undertakings, covenants, terms, conditions and agreements of said Contract on its part, and fully indemnify and save harmless Obligees from all cost and damage which they may suffer by reason of failure so to do, and fully reimburse and repay Obligees all outlay and expense which Obligees may incur in making good any such default, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

The foregoing, however, is subject to the following further provisions:

1. The Surety shall not be liable under this Bond to the Obligees, or either of them, unless the said Obligees, or either of them, shall make payments to the Principal strictly in accordance with the terms of said Contract as to payments, and shall perform all the other obligations to be performed under said Contract at the time and in the manner therein set forth.

2. Surety agrees that any right of action that either of Obligees herein might have under this bond may be assigned to the Secretary of Housing and Urban Development, acting by and through the Federal Housing Commissioner, and that such assignment will in no manner invalidate or qualify this instrument.

3. No suit, action, or proceeding by reason of any default whatever shall be brought on this bond after two years from the day on which the final payment under the Contract falls due.

4. The prior written approval of Surety shall be required with regard to any changes or alterations in said Contract where the cost thereof, added to prior changes or alterations, causes the aggregate cost of all changes and alterations to exceed 10 percent of the original Contract price; but, except as to the foregoing, any alterations which may be made in the terms of the Contract, or in the work to be done under it, or the giving by the Obligees of any extension of time for the performance of the Contract, or any other forbearance on the part of either the Obligees or Principal to the other, shall not in any way release Surety or Principal of the obligations of this instrument, notice to Surety of any such alteration, extension, or forbearance being hereby waived.

5. The aggregate liability of Surety hereunder to the Obligees or their assigns is limited to the penal sum above stated, and Surety, upon making any payment hereunder, shall be subrogated to, and shall be entitled to an assignment of, all rights of the payee, either against Principal or against any other party liable to the payee in connection with the loss which is the subject of the payment.

SIGNED and SEALED this

day of

20

Witness as to Principal

(Principal) (SEAL)

By

(Surety)

By

\$ _____

(Surety)

PERFORMANCE BOND-DUAL OBLIGEE

No. _____

On Behalf of

Date _____, 20 _____

Expires _____, 20 _____

If collecting SSN or EIN:

Privacy Act Statement: The Department of Housing and Urban Development is authorized to collect this information by the National Housing Act, Section 235(b), P.L. 479, 48 Stat. 12 U.S.C. 1701 et seq. HUD is authorized to collect the Social Security Number (SSN) by Section 165(a) of the Housing and Community Development Act of 1987, P.L. 100-242, and by Section 904 of the Stewart B. McKinney Homeless Assistance Amendments Act of 1988, P.L. 100-628. The information is being collected to determine the amount of assistance (if any) the applicant is entitled. The information is also used as a tool for managing the program(s) related to this form, and for protecting the Government's financial interests. **The information may be used to conduct computer-matching programs to check for underreported or unreported income.** The SSN is used as a unique identifier. The information may be released to appropriate Federal, State, and local agencies, and when relevant, to civil, criminal, or regulatory investigators and/or prosecutors. This information will not be otherwise disclosed or released outside of HUD except as permitted or required by law. It is mandatory that you provide all of the requested information, including all SSN(s), for you and all other household members age six years and older. Failure to provide SSN(s) and required documents will result in a delay or loss of assistance payments.

If not collecting SSN or EIN:

Privacy Act Notice: The United States Department of Housing and Urban Development, Federal Housing Administration, is authorized to solicit the information requested in the form by virtue of Title 12, United States Code, Section 1701 et seq., and regulations promulgated thereunder at Title 12, Code of Federal Regulations. While no assurance of confidentiality is pledged to respondents, HUD generally discloses this data only in response to a Freedom of Information Act request.

**Payment Bond
Section 242**

**U.S. Department of Housing
and Urban Development
Office of Hospital Facilities**

OMB Approval No. 2502-0602
(Exp. 4/30/2026)

Public Burden Statement:

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless such collection displays a valid OMB control number. Public reporting burden for this collection of information is estimated to average 1 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The information requested is required in order to receive the benefits to be derived. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the U.S. Department of Housing and Urban Development, Office of the Chief Data Officer, Attention: Departmental Clearance Officer, 451 7th Street SW. Room, Washington, DC 20410 or email Hospitals@hud.gov. HUD collects this information, pursuant to Section 242 of the National Housing Act and regulations at 24 CFR Part 242, in order to review Section 242 applications to determine eligibility, underwrite insured hospital loans, ensure adequate collateral, process initial/final endorsement, manage FHA's hospital portfolio, monitor and manage risk, and ensure ongoing compliance with regulations. No confidentiality is assured.

Warning: Any person who knowingly presents a false, fictitious, or fraudulent statement or claim in a matter within the jurisdiction of the U.S. Department of Housing and Urban Development is subject to criminal penalties, civil liability, and administrative sanctions.

CONTRACTOR (CONSTRUCTION MANAGER)/PRINCIPAL (Name and Address):

LENDER (Name and Address):

OWNER (Name and Address):

SURETY (Name and Principal Place of Business):

PROJECT (Name, FHA Project Number, Location and Brief Description):

CONSTRUCTION CONTRACT or CONSTRUCTION MANGER AGREEMENT:

Date:

Amount:

BOND:

Date:

Amount:

RIDERS TO THIS BOND: ____ Yes ____ No

This Payment Bond is issued simultaneously with a Performance Bond-Dual Obligee (**Performance Bond**) issued in connection with the Project. As used herein, “**Obligees**” shall mean Owner, Lender, Secretary of Housing and Urban Development (“**HUD**”) and the additional obligee(s), if any, identified in a Rider to this Bond and “**Obligee**” shall mean any of the Obligees.

1. Contractor has entered into the Construction Contract or Construction Manager Agreement (select one) with Owner for the construction of the Project (“**Contract**”), which as the same

may now or hereafter be amended by change order or otherwise, is made a part hereof by reference.

2. Contractor and Surety, jointly and severally (“**Obligors**”), bind themselves, their heirs, executors, administrators, successors and assigns, to Obligees, for the use and benefit of Claimants as hereinafter defined in paragraph 3, in the sum of
Dollars (\$) _____), to pay for labor, materials and equipment furnished for use in the performance of the Contract. Any approved increase in the total Contract price shall increase the monetary obligation of Obligors accordingly.
3. A Claimant (“**Claimant**”) is defined as one having a direct contract with Contractor or with a subcontractor of Contractor for labor, materials or equipment used in the performance of the Contract, including without limitation in the terms “labor, materials or equipment” that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract, architectural and engineering services required for performance of the work of Contractor and Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials or equipment was furnished.
4. This obligation shall be null and void if Contractor promptly makes payment to all Claimants for all labor, material, or equipment used in the performance of the Contract.
5. Contractor and Surety hereby jointly and severally agree with Obligees that every Claimant, who has not been paid in full before the expiration of a period of ninety (90) days after having last performed labor or last furnished materials or equipment, may sue on this Payment Bond for the use of such Claimant, prosecute the suit to final judgment for such sum or sums as may be justly due Claimant, and have execution thereon. No Obligee shall be liable for the payment of any costs or expenses of any such suit.
6. Surety shall have no obligation to Claimants under this Payment Bond unless:
 - a. Claimants, who do not have a direct contract with Contractor, have given notice to any two (2) of the above-named parties, those being Contractor, Owner or Surety, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the claim, stating that a claim is being made under this Payment Bond and, with substantial accuracy, the amount claimed and the name of the party to whom the materials or equipment were furnished, or for whom the work or labor was done or performed.
 - b. Any suit, action or proceeding brought by Claimants under this Payment Bond shall be instituted within one (1) year from the later of the date on which (i) Claimants gave the notice required by paragraph 6a, or (ii) the later of the date that Claimants either perform the last labor and/or service or furnish the last materials or equipment under the Contract. If this limitation is deemed to be in contravention of any controlling law, this provision of the Payment Bond is deemed amended so as to

substitute the minimum period of limitation permitted by such controlling law for the above limitation.

7. The amount of this Payment Bond shall be reduced by any payment(s) made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens that may be filed of record against Project, whether or not the claim for the amount of such lien is presented under and against this Payment Bond. Notwithstanding the foregoing, no amounts paid without the written consent of Lender shall reduce the liability of Surety to Lender under this Payment Bond.
8. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.
9. Notice to Surety, Owner, or Contractor shall be served by mailing the same by registered mail or certified mail, postage prepaid, to the address shown on this Payment Bond or to such other address as may have been previously specified by the recipient in a notice given in accordance herewith.

Each signatory below hereby certifies under penalty of perjury such signatory's statements and representations contained in this Payment Bond and all supporting documentation provided by such signatory are true, accurate, and complete. This Payment Bond has been made, presented, and delivered for the purpose of influencing an official action of HUD in insuring the Loan, and may be relied upon by HUD as a true statement of the facts contained therein.

SIGNED and SEALED this _____ day of _____, 20__.

Witness as to Contractor:

CONTRACTOR:

By: _____

Name and Title (Printed)

SURETY:

By: _____

Name and Title (Printed)

Project Name: _____
FHA Project No.: _____

ADDITIONAL OBLIGEE RIDER

(Additional obligee only allowed with prior HUD approval.)

1. This Additional Obligor Rider is attached to and made a part of that certain Payment Bond, dated _____, 20__ executed and delivered by _____, as Contractor, and _____, as Surety, in favor of Obligees, in the sum of _____ (\$ _____) with respect to the Project referenced above.
2. All of the terms, conditions and provisions of the Payment Bond are hereby incorporated herein by this reference as if fully set forth herein.
3. All defined terms as set forth in the Payment Bond shall have the same meaning herein.
4. _____ is hereby added to the Payment Bond as an additional named Obligor.
5. Nothing herein shall alter or affect any of the terms, conditions and other provisions of the Payment Bond, including especially but without limitation, the aggregate liability of Surety as described in paragraph 2 of the Payment Bond.

SIGNED and SEALED this _____ day of _____, 20__.

Witness as to Contractor:

CONTRACTOR: _____

_____ By: _____

Name and Title (Printed)

SURETY: _____

By: _____

Name and Title (Printed)

Project Name: _____
FHA Project Number: _____

ADDITIONAL SURETY RIDER

(Additional surety only allowed with prior HUD approval.)

1. This Additional Surety Rider is attached to and made a part of that certain Payment Bond, dated _____, 20__ executed and delivered by _____, as Contractor, and _____, as Surety, in favor of Obligees, in the sum of _____ (\$_____) with respect to the Project referenced above.
2. All of the terms, conditions and provisions of the Payment Bond are hereby incorporated herein by this reference as if fully set forth herein.
3. All defined terms as set forth in the Payment Bond shall have the same meaning herein.
4. _____ (“**Additional Surety**”) is hereby added to the Payment Bond as an additional named Surety, and all references in the Payment Bond to “Surety” shall include the Additional Surety.
5. Each Surety and Additional Surety (collectively, “**Surety**”) is held and firmly bound, jointly and severally, onto Obligees. Further, each undersigned Surety binds itself in the aforesaid full sum jointly and severally, as well as severally, for the purpose of allowing joint action or singular action against any or all of them in the full amount of this Payment Bond and for all other purposes each Surety binds itself, jointly and severally with Contractor, for the payment of the full sums above stated.
6. Nothing herein shall alter or affect any of the terms, conditions and other provisions of the Payment Bond, including especially but without limitation, the aggregate liability of Surety as described in paragraph 2 of the Payment Bond.

SIGNED AND SEALED this _____ day of _____, 20__.

Witness as to Contractor:

CONTRACTOR:

By: _____

Name and Title (Printed)

SURETY

ADDITIONAL SURETY:

By: _____

By: _____

Names and Title (Printed)

Name and Title (Printed)

A. APPLICABILITY

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

(1) MINIMUM WAGES

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

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH1321)) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place, where it can be easily seen by the workers.

(ii) Additional Classifications.

- (A) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:
- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
 - (2) The classification is utilized in the area by the construction industry; and
 - (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (B) If the contractor, the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division ("Administrator"), Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget ("OMB") under OMB control number 1235-0023.)
- (C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, or HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

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

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

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

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

(3) Payrolls and basic records.

(i) **Maintaining Payroll Records.** Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification(s), hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid.

Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1235-0023 and 1215-0018)

(ii) Certified Payroll Reports.

(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <https://www.dol.gov/agencies/whd/forms> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the U.S. Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1235-0008.)

- (B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;
 - (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;
 - (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract; and
- (C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (a)(3)(ii)(b).
- (D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

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

(4) Apprentices and Trainees.

- (i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency (where appropriate), to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination.

Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program.

If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

- (5) **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.
- (6) **Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs (1) through (11) in this paragraph (a) and such other clauses as HUD or its designee may, by appropriate instructions, require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.
- (7) **Contract termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
- (8) **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this Contract.
- (9) **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.
- (10) **Certification of Eligibility.**
- (i) By entering into this Contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

- (ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.
- (iii) Anyone who knowingly makes, presents, or submits a false, fictitious, or fraudulent statement, representation or certification is subject to criminal, civil and/or administrative sanctions, including fines, penalties, and imprisonment (e.g., 18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §§ 3729, 3802).

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

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The provisions of this paragraph (b) are applicable where the amount of the prime contract exceeds **\$100,000**. As used in this paragraph, the terms “laborers” and “mechanics” include watchmen and guards.

- (1) Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek, unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in subparagraph B(1) of this paragraph, the contractor, and any subcontractor responsible therefor, shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph B(1) of this paragraph, in the sum of **\$27** for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph B(1) of this paragraph. In accordance with the Federal Civil Penalties Inflation Adjustment Act of 1990 (28 U.S.C. § 2461 Note), the Department of Labor adjusts this civil monetary penalty for inflation no later than January 15 each year.
- (3) Withholding for unpaid wages and liquidated damages.** HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from any moneys payable on account of work performed by the contractor or subcontractor under any such contract, or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages, as provided in the clause set forth in subparagraph B(2) of this paragraph.
- (4) Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph B(1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs B(1) through (4) of this paragraph.

C. HEALTH AND SAFETY

The provisions of this paragraph (c) are applicable where the amount of the prime contract exceeds **\$100,000**.

- (1)** No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
- (2)** The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.
- (3)** The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.



Office of Federal Contract Compliance Programs

Executive Order 11246, As Amended

Executive Order 11246 — Equal Employment Opportunity

SOURCE: The provisions of Executive Order 11246 of Sept. 24, 1965, appear at 30 FR 12319, 12935, 3 CFR, 1964–1965 Comp., p.339, unless otherwise noted.

Under and by virtue of the authority vested in me as President of the United States by the Constitution and statutes of the United States, it is ordered as follows:

Part I — Nondiscrimination in Government Employment

[Part I superseded by EO 11478 of Aug. 8, 1969, 34 FR 12985, 3 CFR, 1966–1970 Comp., p. 803]

Part II – Nondiscrimination in Employment by Government Contractors and Subcontractors

Subpart A – Duties of the Secretary of Labor

SEC. 201

The Secretary of Labor shall be responsible for the administration and enforcement of Parts II and III of this Order. The Secretary shall adopt such rules and regulations and issue such orders as are deemed necessary and appropriate to achieve the purposes of Parts II and III of this Order.

[Sec. 201 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

Subpart B – Contractors' Agreements

SEC. 202

Except in contracts exempted in accordance with Section 204 of this Order, all Government contracting agencies shall include in every Government contract hereafter entered into the following provisions:

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

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
2. The contractor will, in all solicitations or advancements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the

employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
5. The contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
6. The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
8. The contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the contractor may request the United States to enter into such litigation to protect the interests of the United States. [Sec. 202 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966-1970 Comp., p. 684, EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230, EO 13665 of April 8, 2014, 79 FR 20749, EO 13672 of July 21, 2014, 79 FR 42971]

SEC. 203

- a. Each contractor having a contract containing the provisions prescribed in Section 202 shall file, and shall cause each of his subcontractors to file, Compliance Reports with the contracting agency or the Secretary of Labor as may be directed. Compliance Reports shall be filed within such times and shall contain such information as to the practices, policies, programs, and employment policies, programs, and employment statistics of the contractor and each subcontractor, and shall be in such form, as the Secretary of Labor may prescribe.

- b. Bidders or prospective contractors or subcontractors may be required to state whether they have participated in any previous contract subject to the provisions of this Order, or any preceding similar Executive order, and in that event to submit, on behalf of themselves and their proposed subcontractors, Compliance Reports prior to or as an initial part of their bid or negotiation of a contract.
- c. Whenever the contractor or subcontractor has a collective bargaining agreement or other contract or understanding with a labor union or an agency referring workers or providing or supervising apprenticeship or training for such workers, the Compliance Report shall include such information as to such labor union's or agency's practices and policies affecting compliance as the Secretary of Labor may prescribe: Provided, that to the extent such information is within the exclusive possession of a labor union or an agency referring workers or providing or supervising apprenticeship or training and such labor union or agency shall refuse to furnish such information to the contractor, the contractor shall so certify to the Secretary of Labor as part of its Compliance Report and shall set forth what efforts he has made to obtain such information.
- d. The Secretary of Labor may direct that any bidder or prospective contractor or subcontractor shall submit, as part of his Compliance Report, a statement in writing, signed by an authorized officer or agent on behalf of any labor union or any agency referring workers or providing or supervising apprenticeship or other training, with which the bidder or prospective contractor deals, with supporting information, to the effect that the signer's practices and policies do not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, or national origin, and that the signer either will affirmatively cooperate in the implementation of the policy and provisions of this Order or that it consents and agrees that recruitment, employment, and the terms and conditions of employment under the proposed contract shall be in accordance with the purposes and provisions of the order. In the event that the union, or the agency shall refuse to execute such a statement, the Compliance Report shall so certify and set forth what efforts have been made to secure such a statement and such additional factual material as the Secretary of Labor may require.

[Sec. 203 amended by EO 11375 of Oct. 13, 1967, 32 FR 14303, 3 CFR, 1966–1970 Comp., p. 684; EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230, EO 13672 of July 21, 2104, 79 FR 42971]

SEC. 204

- a. The Secretary of Labor may, when the Secretary deems that special circumstances in the national interest so require, exempt a contracting agency from the requirement of including any or all of the provisions of Section 202 of this **Order** in any specific contract, subcontract, or purchase **order**.
- b. The Secretary of Labor may, by rule or regulation, exempt certain classes of contracts, subcontracts, or purchase orders (1) whenever work is to be or has been performed outside the United States and no recruitment of workers within the limits of the United States is involved; (2) for standard commercial supplies or raw materials; (3) involving less than specified amounts of money or specified numbers of workers; or (4) to the extent that they involve subcontracts below a specified tier.
- c. Section 202 of this **Order** shall not apply to a Government contractor or subcontractor that is a religious corporation, association, educational institution, or society, with respect to the employment of individuals of a particular religion to perform work connected with the carrying on by such corporation, association, educational institution, or society of its activities. Such contractors and subcontractors are not exempted or excused from complying with the other requirements contained in this **Order**.

- d. The Secretary of Labor may also provide, by rule, regulation, or order, for the exemption of facilities of a contractor that are in all respects separate and distinct from activities of the contractor related to the performance of the contract: provided, that such an exemption will not interfere with or impede the effectuation of the purposes of this **Order**: and provided further, that in the absence of such an exemption all facilities shall be covered by the provisions of this **Order**.

[Sec. 204 amended by EO 13279 of Dec. 16, 2002, 67 FR 77141, 3 CFR, 2002 Comp., p. 77141 – 77144]

Subpart C – Powers and Duties of the Secretary of Labor and the Contracting Agencies

SEC. 205

The Secretary of Labor shall be responsible for securing compliance by all Government contractors and subcontractors with this Order and any implementing rules or regulations. All contracting agencies shall comply with the terms of this Order and any implementing rules, regulations, or orders of the Secretary of Labor. Contracting agencies shall cooperate with the Secretary of Labor and shall furnish such information and assistance as the Secretary may require.

[Sec. 205 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 206

- a. The Secretary of Labor may investigate the employment practices of any Government contractor or subcontractor to determine whether or not the contractual provisions specified in Section 202 of this Order have been violated. Such investigation shall be conducted in accordance with the procedures established by the Secretary of Labor.
- b. The Secretary of Labor may receive and investigate complaints by employees or prospective employees of a Government contractor or subcontractor which allege discrimination contrary to the contractual provisions specified in Section 202 of this Order.

[Sec. 206 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 207

The Secretary of Labor shall use his/her best efforts, directly and through interested Federal, State, and local agencies, contractors, and all other available instrumentalities to cause any labor union engaged in work under Government contracts or any agency referring workers or providing or supervising apprenticeship or training for or in the course of such work to cooperate in the implementation of the purposes of this Order. The Secretary of Labor shall, in appropriate cases, notify the Equal Employment Opportunity Commission, the Department of Justice, or other appropriate Federal agencies whenever it has reason to believe that the practices of any such labor organization or agency violate Title VI or Title VII of the Civil Rights Act of 1964 or other provision of Federal law.

[Sec. 207 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 208

- a. The Secretary of Labor, or any agency, officer, or employee in the executive branch of the Government designated by rule, regulation, or order of the Secretary, may hold such hearings, public or private, as the Secretary may deem advisable for compliance, enforcement, or educational purposes.
- b. The Secretary of Labor may hold, or cause to be held, hearings in accordance with Subsection of this Section prior to imposing, ordering, or recommending the imposition of penalties and sanctions under this Order. No order for debarment of any contractor from further Government contracts under Section 209(6) shall be made without affording the contractor an opportunity for a hearing.

Subpart D – Sanctions and Penalties

SEC. 209

In accordance with such rules, regulations, or orders as the Secretary of Labor may issue or adopt, the Secretary may:

1. Publish, or cause to be published, the names of contractors or unions which it has concluded have complied or have failed to comply with the provisions of this Order or of the rules, regulations, and orders of the Secretary of Labor.
2. Recommend to the Department of Justice that, in cases in which there is substantial or material violation or the threat of substantial or material violation of the contractual provisions set forth in Section 202 of this Order, appropriate proceedings be brought to enforce those provisions, including the enjoining, within the limitations of applicable law, of organizations, individuals, or groups who prevent directly or indirectly, or seek to prevent directly or indirectly, compliance with the provisions of this Order.
3. Recommend to the Equal Employment Opportunity Commission or the Department of Justice that appropriate proceedings be instituted under Title VII of the Civil Rights Act of 1964.
4. Recommend to the Department of Justice that criminal proceedings be brought for the furnishing of false information to any contracting agency or to the Secretary of Labor as the case may be.
5. After consulting with the contracting agency, direct the contracting agency to cancel, terminate, suspend, or cause to be cancelled, terminated, or suspended, any contract, or any portion or portions thereof, for failure of the contractor or subcontractor to comply with equal employment opportunity provisions of the contract. Contracts may be cancelled, terminated, or suspended absolutely or continuance of contracts may be conditioned upon a program for future compliance approved by the Secretary of Labor.
6. Provide that any contracting agency shall refrain from entering into further contracts, or extensions or other modifications of existing contracts, with any noncomplying contractor, until such contractor has satisfied the Secretary of Labor that such contractor has established and will carry out personnel and employment policies in compliance with the provisions of this Order.

(b) Pursuant to rules and regulations prescribed by the Secretary of Labor, the Secretary shall make reasonable efforts, within a reasonable time limitation, to secure compliance with the contract provisions of this Order by methods of conference, conciliation, mediation, and persuasion before proceedings shall be instituted under subsection (a)(2) of this Section, or before a contract shall be cancelled or terminated in whole or in part under subsection (a)(5) of this Section.

[Sec. 209 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 210

Whenever the Secretary of Labor makes a determination under Section 209, the Secretary shall promptly notify the appropriate agency. The agency shall take the action directed by the Secretary and shall report the results of the action it has taken to the Secretary of Labor within such time as the Secretary shall specify. If the contracting agency fails to take the action directed within thirty days, the Secretary may take the action directly.

[Sec. 210 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p 230]

SEC. 211

If the Secretary shall so direct, contracting agencies shall not enter into contracts with any bidder or prospective contractor unless the bidder or prospective contractor has satisfactorily complied with the provisions of this Order or submits a program for compliance acceptable to the Secretary of Labor.

[Sec. 211 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 212

When a contract has been cancelled or terminated under Section 209(a)(5) or a contractor has been debarred from further Government contracts under Section 209(a)(6) of this Order, because of noncompliance with the contract provisions specified in Section 202 of this Order, the Secretary of Labor shall promptly notify the Comptroller General of the United States.

[Sec. 212 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

Subpart E – Certificates of Merit

SEC. 213

The Secretary of Labor may provide for issuance of a United States Government Certificate of Merit to employers or labor unions, or other agencies which are or may hereafter be engaged in work under Government contracts, if the Secretary is satisfied that the personnel and employment practices of the employer, or that the personnel, training, apprenticeship, membership, grievance and representation, upgrading, and other practices and policies of the labor union or other agency conform to the purposes and provisions of this Order.

SEC. 214

Any Certificate of Merit may at any time be suspended or revoked by the Secretary of Labor if the holder thereof, in the judgment of the Secretary, has failed to comply with the provisions of this Order.

SEC. 215

The Secretary of Labor may provide for the exemption of any employer, labor union, or other agency from any reporting requirements imposed under or pursuant to this Order if such employer, labor union, or other agency has been awarded a Certificate of Merit which has not been suspended or revoked.

Part III – Nondiscrimination Provisions in Federally Assisted Construction Contracts

SEC. 301

Each executive department and agency, which administers a program involving Federal financial assistance shall require as a condition for the approval of any grant, contract, loan, insurance, or guarantee thereunder, which may involve a construction contract, that the applicant for Federal assistance undertake and agree to incorporate, or cause to be incorporated, into all construction contracts paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to such grant, contract, loan, insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the provisions prescribed for Government contracts by Section 202 of this Order or such modification thereof, preserving in substance the contractor's obligations thereunder, as may be approved by the Secretary of Labor, together with such additional provisions as the Secretary deems appropriate to establish and protect the interest of the United States in the enforcement of those obligations. Each such applicant shall also undertake and agree (1) to assist and cooperate actively with the Secretary of Labor in obtaining the compliance of contractors and subcontractors with those contract provisions and with the rules, regulations and relevant orders of the Secretary, (2) to obtain and to furnish to the Secretary of Labor such information as the Secretary may require for the supervision of such compliance, (3) to carry out sanctions and penalties for violation of such obligations imposed upon contractors and subcontractors by the Secretary of Labor pursuant to Part II, Subpart D, of this Order, and (4) to refrain from entering into any contract subject to this Order, or extension or other modification of such a contract with a contractor debarred from Government contracts under Part II, Subpart D, of this Order.

[Sec. 301 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 302

- a. "Construction contract" as used in this Order means any contract for the construction, rehabilitation, alteration, conversion, extension, or repair of buildings, highways, or other improvements to real property.
- b. The provisions of Part II of this Order shall apply to such construction contracts, and for purposes of such application the administering department or agency shall be considered the contracting agency referred to therein.
- c. The term "applicant" as used in this Order means an applicant for Federal assistance or, as determined by agency regulation, other program participant, with respect to whom an application for any grant, contract, loan, insurance, or guarantee is not finally acted upon prior to the effective date of this Part, and it includes such an applicant after he/she becomes a recipient of such Federal assistance.

SEC. 303

- a. The Secretary of Labor shall be responsible for obtaining the compliance of such applicants with their undertakings under this Order. Each administering department and agency is directed to cooperate with the Secretary of Labor

and to furnish the Secretary such information and assistance as the Secretary may require in the performance of the Secretary's functions under this Order.

- b. In the event an applicant fails and refuses to comply with the applicant's undertakings pursuant to this Order, the Secretary of Labor may, after consulting with the administering department or agency, take any or all of the following actions: (1) direct any administering department or agency to cancel, terminate, or suspend in whole or in part the agreement, contract or other arrangement with such applicant with respect to which the failure or refusal occurred; (2) direct any administering department or agency to refrain from extending any further assistance to the applicant under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received by the Secretary of Labor from such applicant; and (3) refer the case to the Department of Justice or the Equal Employment Opportunity Commission for appropriate law enforcement or other proceedings.
- c. In no case shall action be taken with respect to an applicant pursuant to clause (1) or (2) of subsection (b) without notice and opportunity for hearing.

[Sec. 303 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 304

Any executive department or agency which imposes by rule, regulation, or order requirements of nondiscrimination in employment, other than requirements imposed pursuant to this Order, may delegate to the Secretary of Labor by agreement such responsibilities with respect to compliance standards, reports, and procedures as would tend to bring the administration of such requirements into conformity with the administration of requirements imposed under this Order: Provided, That actions to effect compliance by recipients of Federal financial assistance with requirements imposed pursuant to Title VI of the Civil Rights Act of 1964 shall be taken in conformity with the procedures and limitations prescribed in Section 602 thereof and the regulations of the administering department or agency issued thereunder.

Part IV – Miscellaneous

SEC. 401

The Secretary of Labor may delegate to any officer, agency, or employee in the Executive branch of the Government, any function or duty of the Secretary under Parts II and III of this Order.

[Sec. 401 amended by EO 12086 of Oct. 5, 1978, 43 FR 46501, 3 CFR, 1978 Comp., p. 230]

SEC. 402

The Secretary of Labor shall provide administrative support for the execution of the program known as the "Plans for Progress."

SEC. 403

- a. Executive Orders Nos. 10590 (January 19, 1955), 10722 (August 5, 1957), 10925 (March 6, 1961), 11114 (June 22, 1963), and 11162 (July 28, 1964), are hereby superseded and the President's Committee on Equal Employment Opportunity established by Executive Order No. 10925 is hereby abolished. All records and property in the custody of the Committee shall be transferred to the Office of Personnel Management and the Secretary of Labor, as appropriate.
- b. Nothing in this Order shall be deemed to relieve any person of any obligation assumed or imposed under or pursuant to any Executive Order superseded by this Order. All rules, regulations, orders, instructions, designations, and other directives issued by the President's Committee on Equal Employment Opportunity and those issued by the heads of various departments or agencies under or pursuant to any of the Executive orders superseded by this Order, shall, to the extent that they are not inconsistent with this Order, remain in full

force and effect unless and until revoked or superseded by appropriate authority. References in such directives to provisions of the superseded orders shall be deemed to be references to the comparable provisions of this Order.

[Sec. 403 amended by EO 12107 of Dec. 28, 1978, 44 FR 1055, 3 CFR, 1978 Comp., p, 264]

SEC. 404

The General Services Administration shall take appropriate action to revise the standard Government contract forms to accord with the provisions of this Order and of the rules and regulations of the Secretary of Labor.

SEC. 405

This Order shall become effective thirty days after the date of this Order.

Agencies

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Office of Federal Contract Compliance Programs

An agency within the U.S. Department of Labor
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8/8

SECTION 3 CLAUSE per CFR PART 75 (FINAL RULE)

All Section 3 covered contracts shall include the following clause (referred to as the "Section 3 Clause"):

A. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended by the Housing and Community Development Act of 1992 (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

B. The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 75 regulations.

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

D. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 75, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 75. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 75.

E. The contractor will certify that any vacant employment positions, including training positions that are filled (1) after the contractor is selected by before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 75 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 75.

F. Noncompliance with HUD's regulations in 24 CFR part 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

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

"General Decision Number: MI20250125 02/21/2025

Superseded General Decision Number: MI20240125

State: Michigan

Construction Type: Building

County: Huron County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/03/2025
1	01/24/2025
2	02/21/2025

ASBE0047-005 07/01/2024

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 38.00	21.60

BOIL0169-002 01/01/2024

	Rates	Fringes
BOILERMAKER.....	\$ 39.65	35.68

BRMI0009-018 08/01/2024

	Rates	Fringes
BRICKLAYER.....	\$ 35.14	24.20
PLASTERER.....	\$ 33.09	26.58
TILE SETTER.....	\$ 31.43	21.13

CARP0706-011 06/01/2024		
	Rates	Fringes
CARPENTER (Excluding Acoustical Ceiling Installation, Drywall Hanging, Form Work, Metal Stud Installation, and Soft Floor Layer - Carpet).....	\$ 33.11	23.64

CARP0706-019 06/01/2024		
	Rates	Fringes
CARPENTER (Acoustical Ceiling Installation, Form Work, Metal Stud Installation, and Lather Drywall Hanging).....	\$ 33.11	23.64

CARP1102-003 06/01/2024		
	Rates	Fringes
MILLWRIGHT.....	\$ 36.47	40.52

ELEC0058-005 06/28/2024		
	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring).....	\$ 51.32	28.44
ELECTRICIAN (Low Voltage Wiring Only)		
Installer.....	\$ 30.12	14.57
Technician.....	\$ 37.62	14.80

ENGI0324-022 06/01/2024		
	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1.....	\$ 47.28	25.25
GROUP 2.....	\$ 43.93	25.25
GROUP 3.....	\$ 41.28	25.25
GROUP 4.....	\$ 39.57	25.25
GROUP 5.....	\$ 33.71	25.25
GROUP 6.....	\$ 31.23	25.25
Crane operator with main boom and jib 300' or longer: \$1.50 per hour above the group 1 rate.		
Crane operator with main boom and jib 400' or longer: \$3.00 per hour above the group 1 rate.		
PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.		
POWER EQUIPMENT OPERATOR CLASSIFICATIONS		
GROUP 1: Crane operator with main boom and jib 400', 300', or 220' or longer.		
GROUP 2: Crane operator with main boom and jib 140' or longer, tower crane, gantry crane, whirley derrick		
GROUP 3: Backhoe/Excavator; Crane; Loader; Paver; Scraper; Stiff Leg Derrick		
GROUP 4: Bobcat/Skid Loader; Fork Truck (over 20' lift)		
GROUP 5: Fork Truck (20' lift and under for masonry work)		
GROUP 6: Oiler		

IRON0025-009 04/01/2024		
	Rates	Fringes
IRONWORKER, STRUCTURAL (Metal Building Erection Only).....	\$ 31.00	28.91

IRON0025-010 06/01/2024

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 33.43	37.15
IRONWORKER, STRUCTURAL.....	\$ 35.55	35.83

LAB01098-031 07/01/2024

	Rates	Fringes
LABORER		
Common or General; Mason		
Tender - Brick; Mason		
Tender - Cement/Concrete;		
and Pipelayer.....	\$ 26.20	13.45
Sandblaster.....	\$ 26.73	13.45

PAIN1474-007 06/01/2010

	Rates	Fringes
PAINTER: Brush, Roller and		
Spray.....	\$ 23.79	12.02
PAINTER: Drywall		
Finishing/Taping.....	\$ 23.79	12.02

PLAS0016-038 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 25.47	12.38

PLUM0085-008 05/04/2024

Portion of Huron County lying west of M-53

	Rates	Fringes
PIPEFITTER (Excludes HVAC		
Pipe and System Installation)....	\$ 45.50	21.75
PIPEFITTER (HVAC Pipe		
Installation Only).....	\$ 45.50	21.75
PLUMBER (Excluding HVAC Pipe		
and System Installation).....	\$ 43.50	22.10

PLUM0098-006 06/01/2023

Portion of Huron County lying east of M-53

	Rates	Fringes
PLUMBER (Excluding HVAC Pipe		
& System Installation).....	\$ 35.79	30.54

PLUM0636-005 06/05/2023

Portion of Huron County lying east of M-53

	Rates	Fringes
PIPEFITTER (Includes HVAC		
Pipe Installation; Excludes		
HVAC System Installation).....	\$ 44.70	35.37

* SFMI0669-003 01/02/2025

	Rates	Fringes
SPRINKLER FITTER (Fire		
Sprinklers).....	\$ 41.34	27.39

SHEE0007-021 05/01/2018

	Rates	Fringes
SHEET METAL WORKER (Excluding		
HVAC Duct & System		
Installation).....	\$ 26.83	23.78
SHEET METAL WORKER (HVAC Duct		

& System Installation).....\$ 26.83 23.78

* SUMI2011-050 02/14/2011

	Rates	Fringes
CARPENTER (Floor Laying-Carpet Only).....	\$ 19.59	7.57
GLAZIER.....	\$ 16.95 **	4.74
LABORER: Landscape & Irrigation.....	\$ 12.84 **	0.00
OPERATOR: Bulldozer.....	\$ 22.34	1.22
OPERATOR: Grader/Blade.....	\$ 24.04	6.03
OPERATOR: Roller.....	\$ 28.02	7.07
OPERATOR: Tractor.....	\$ 19.60	7.31
ROOFER.....	\$ 15.73 **	7.41
TRUCK DRIVER, Includes Dump and Tandem Truck.....	\$ 15.65 **	3.12
TRUCK DRIVER: Flatbed Truck.....	\$ 16.80 **	3.97

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

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.75) or 13658 (\$13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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

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

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

- a) a survey underlying a wage determination
- b) an existing published wage determination

- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

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

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

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

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

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

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

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

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

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END OF GENERAL DECISION"

Equal Employment Opportunity is **THE LAW**

Private Employers, State and Local Governments, Educational Institutions, Employment Agencies and Labor Organizations

Applicants to and employees of most private employers, state and local governments, educational institutions, employment agencies and labor organizations are protected under Federal law from discrimination on the following bases:

RACE, COLOR, RELIGION, SEX, NATIONAL ORIGIN

Title VII of the Civil Rights Act of 1964, as amended, protects applicants and employees from discrimination in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment, on the basis of race, color, religion, sex (including pregnancy), or national origin. Religious discrimination includes failing to reasonably accommodate an employee's religious practices where the accommodation does not impose undue hardship.

DISABILITY

Title I and Title V of the Americans with Disabilities Act of 1990, as amended, protect qualified individuals from discrimination on the basis of disability in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. Disability discrimination includes not making reasonable accommodation to the known physical or mental limitations of an otherwise qualified individual with a disability who is an applicant or employee, barring undue hardship.

AGE

The Age Discrimination in Employment Act of 1967, as amended, protects applicants and employees 40 years of age or older from discrimination based on age in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment.

SEX (WAGES)

In addition to sex discrimination prohibited by Title VII of the Civil Rights Act, as amended, the Equal Pay Act of 1963, as amended, prohibits sex discrimination in the payment of wages to women and men performing substantially equal work, in jobs that require equal skill, effort, and responsibility, under similar working conditions, in the same establishment.

GENETICS

Title II of the Genetic Information Nondiscrimination Act of 2008 protects applicants and employees from discrimination based on genetic information in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. GINA also restricts employers' acquisition of genetic information and strictly limits disclosure of genetic information. Genetic information includes information about genetic tests of applicants, employees, or their family members; the manifestation of diseases or disorders in family members (family medical history); and requests for or receipt of genetic services by applicants, employees, or their family members.

RETALIATION

All of these Federal laws prohibit covered entities from retaliating against a person who files a charge of discrimination, participates in a discrimination proceeding, or otherwise opposes an unlawful employment practice.

WHAT TO DO IF YOU BELIEVE DISCRIMINATION HAS OCCURRED

There are strict time limits for filing charges of employment discrimination. To preserve the ability of EEOC to act on your behalf and to protect your right to file a private lawsuit, should you ultimately need to, you should contact EEOC promptly when discrimination is suspected:

The U.S. Equal Employment Opportunity Commission (EEOC), 1-800-669-4000 (toll-free) or 1-800-669-6820 (toll-free TTY number for individuals with hearing impairments). EEOC field office information is available at www.eeoc.gov or in most telephone directories in the U.S. Government or Federal Government section. Additional information about EEOC, including information about charge filing, is available at www.eeoc.gov.

Employers Holding Federal Contracts or Subcontracts

Applicants to and employees of companies with a Federal government contract or subcontract are protected under Federal law from discrimination on the following bases:

RACE, COLOR, RELIGION, SEX, NATIONAL ORIGIN

Executive Order 11246, as amended, prohibits job discrimination on the basis of race, color, religion, sex or national origin, and requires affirmative action to ensure equality of opportunity in all aspects of employment.

INDIVIDUALS WITH DISABILITIES

Section 503 of the Rehabilitation Act of 1973, as amended, protects qualified individuals from discrimination on the basis of disability in hiring, promotion, discharge, pay, fringe benefits, job training, classification, referral, and other aspects of employment. Disability discrimination includes not making reasonable accommodation to the known physical or mental limitations of an otherwise qualified individual with a disability who is an applicant or employee, barring undue hardship. Section 503 also requires that Federal contractors take affirmative action to employ and advance in employment qualified individuals with disabilities at all levels of employment, including the executive level.

DISABLED, RECENTLY SEPARATED, OTHER PROTECTED, AND ARMED FORCES SERVICE MEDAL VETERANS

The Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended, 38 U.S.C. 4212, prohibits job discrimination and requires affirmative action to employ and advance in employment disabled veterans, recently separated veterans (within

three years of discharge or release from active duty), other protected veterans (veterans who served during a war or in a campaign or expedition for which a campaign badge has been authorized), and Armed Forces service medal veterans (veterans who, while on active duty, participated in a U.S. military operation for which an Armed Forces service medal was awarded).

RETALIATION

Retaliation is prohibited against a person who files a complaint of discrimination, participates in an OFCCP proceeding, or otherwise opposes discrimination under these Federal laws.

Any person who believes a contractor has violated its nondiscrimination or affirmative action obligations under the authorities above should contact immediately:

The Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210, 1-800-397-6251 (toll-free) or (202) 693-1337 (TTY). OFCCP may also be contacted by e-mail at OFCCP-Public@dol.gov, or by calling an OFCCP regional or district office, listed in most telephone directories under U.S. Government, Department of Labor.

Programs or Activities Receiving Federal Financial Assistance

RACE, COLOR, NATIONAL ORIGIN, SEX

In addition to the protections of Title VII of the Civil Rights Act of 1964, as amended, Title VI of the Civil Rights Act of 1964, as amended, prohibits discrimination on the basis of race, color or national origin in programs or activities receiving Federal financial assistance. Employment discrimination is covered by Title VI if the primary objective of the financial assistance is provision of employment, or where employment discrimination causes or may cause discrimination in providing services under such programs. Title IX of the Education Amendments of 1972 prohibits employment discrimination on the basis of sex in educational programs or activities which receive Federal financial assistance.

INDIVIDUALS WITH DISABILITIES

Section 504 of the Rehabilitation Act of 1973, as amended, prohibits employment discrimination on the basis of disability in any program or activity which receives Federal financial assistance. Discrimination is prohibited in all aspects of employment against persons with disabilities who, with or without reasonable accommodation, can perform the essential functions of the job.

If you believe you have been discriminated against in a program of any institution which receives Federal financial assistance, you should immediately contact the Federal agency providing such assistance.

EMPLOYEE RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

**PREVAILING
WAGES**

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

or contact the U.S. Department of Labor’s Wage and Hour Division.



WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

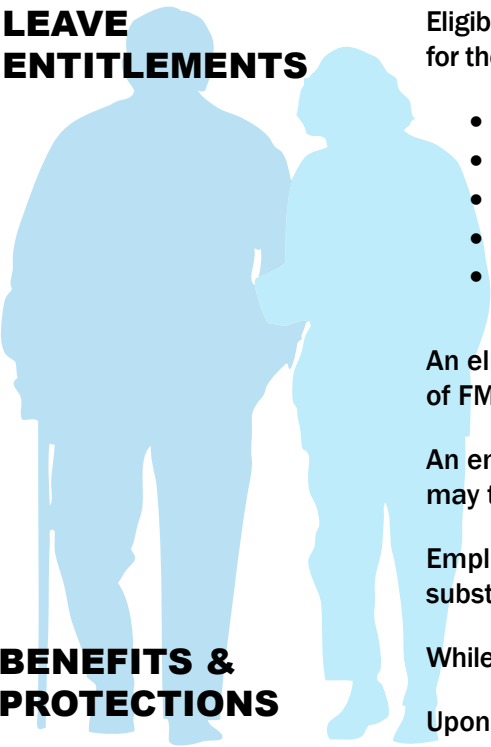
1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd



EMPLOYEE RIGHTS UNDER THE FAMILY AND MEDICAL LEAVE ACT

THE UNITED STATES DEPARTMENT OF LABOR WAGE AND HOUR DIVISION

LEAVE ENTITLEMENTS



Eligible employees who work for a covered employer can take up to 12 weeks of unpaid, job-protected leave in a 12-month period for the following reasons:

- The birth of a child or placement of a child for adoption or foster care;
- To bond with a child (leave must be taken within one year of the child’s birth or placement);
- To care for the employee’s spouse, child, or parent who has a qualifying serious health condition;
- For the employee’s own qualifying serious health condition that makes the employee unable to perform the employee’s job;
- For qualifying exigencies related to the foreign deployment of a military member who is the employee’s spouse, child, or parent.

An eligible employee who is a covered servicemember’s spouse, child, parent, or next of kin may also take up to 26 weeks of FMLA leave in a single 12-month period to care for the servicemember with a serious injury or illness.

An employee does not need to use leave in one block. When it is medically necessary or otherwise permitted, employees may take leave intermittently or on a reduced schedule.

Employees may choose, or an employer may require, use of accrued paid leave while taking FMLA leave. If an employee substitutes accrued paid leave for FMLA leave, the employee must comply with the employer’s normal paid leave policies.

While employees are on FMLA leave, employers must continue health insurance coverage as if the employees were not on leave.

Upon return from FMLA leave, most employees must be restored to the same job or one nearly identical to it with equivalent pay, benefits, and other employment terms and conditions.

An employer may not interfere with an individual’s FMLA rights or retaliate against someone for using or trying to use FMLA leave, opposing any practice made unlawful by the FMLA, or being involved in any proceeding under or related to the FMLA.

BENEFITS & PROTECTIONS

ELIGIBILITY REQUIREMENTS

An employee who works for a covered employer must meet three criteria in order to be eligible for FMLA leave. The employee must:

- Have worked for the employer for at least 12 months;
- Have at least 1,250 hours of service in the 12 months before taking leave;* and
- Work at a location where the employer has at least 50 employees within 75 miles of the employee’s worksite.

*Special “hours of service” requirements apply to airline flight crew employees.

REQUESTING LEAVE

Generally, employees must give 30-days’ advance notice of the need for FMLA leave. If it is not possible to give 30-days’ notice, an employee must notify the employer as soon as possible and, generally, follow the employer’s usual procedures.

Employees do not have to share a medical diagnosis, but must provide enough information to the employer so it can determine if the leave qualifies for FMLA protection. Sufficient information could include informing an employer that the employee is or will be unable to perform his or her job functions, that a family member cannot perform daily activities, or that hospitalization or continuing medical treatment is necessary. Employees must inform the employer if the need for leave is for a reason for which FMLA leave was previously taken or certified.

Employers can require a certification or periodic recertification supporting the need for leave. If the employer determines that the certification is incomplete, it must provide a written notice indicating what additional information is required.

Once an employer becomes aware that an employee’s need for leave is for a reason that may qualify under the FMLA, the employer must notify the employee if he or she is eligible for FMLA leave and, if eligible, must also provide a notice of rights and responsibilities under the FMLA. If the employee is not eligible, the employer must provide a reason for ineligibility.

Employers must notify its employees if leave will be designated as FMLA leave, and if so, how much leave will be designated as FMLA leave.

Employees may file a complaint with the U.S. Department of Labor, Wage and Hour Division, or may bring a private lawsuit against an employer.

The FMLA does not affect any federal or state law prohibiting discrimination or supersede any state or local law or collective bargaining agreement that provides greater family or medical leave rights.

EMPLOYER RESPONSIBILITIES

ENFORCEMENT

For additional information or to file a complaint:

1-866-4-USWAGE

(1-866-487-9243) TTY: 1-877-889-5627

www.dol.gov/whd

U.S. Department of Labor | Wage and Hour Division



EMPLOYEE RIGHTS

UNDER THE FAIR LABOR STANDARDS ACT

FEDERAL MINIMUM WAGE

\$7.25 PER HOUR

BEGINNING JULY 24, 2009

The law requires employers to display this poster where employees can readily see it.

OVERTIME PAY At least 1½ times the regular rate of pay for all hours worked over 40 in a workweek.

CHILD LABOR An employee must be at least 16 years old to work in most non-farm jobs and at least 18 to work in non-farm jobs declared hazardous by the Secretary of Labor. Youths 14 and 15 years old may work outside school hours in various non-manufacturing, non-mining, non-hazardous jobs with certain work hours restrictions. Different rules apply in agricultural employment.

TIP CREDIT Employers of “tipped employees” who meet certain conditions may claim a partial wage credit based on tips received by their employees. Employers must pay tipped employees a cash wage of at least \$2.13 per hour if they claim a tip credit against their minimum wage obligation. If an employee’s tips combined with the employer’s cash wage of at least \$2.13 per hour do not equal the minimum hourly wage, the employer must make up the difference.

NURSING MOTHERS The FLSA requires employers to provide reasonable break time for a nursing mother employee who is subject to the FLSA’s overtime requirements in order for the employee to express breast milk for her nursing child for one year after the child’s birth each time such employee has a need to express breast milk. Employers are also required to provide a place, other than a bathroom, that is shielded from view and free from intrusion from coworkers and the public, which may be used by the employee to express breast milk.

ENFORCEMENT The Department has authority to recover back wages and an equal amount in liquidated damages in instances of minimum wage, overtime, and other violations. The Department may litigate and/or recommend criminal prosecution. Employers may be assessed civil money penalties for each willful or repeated violation of the minimum wage or overtime pay provisions of the law. Civil money penalties may also be assessed for violations of the FLSA’s child labor provisions. Heightened civil money penalties may be assessed for each child labor violation that results in the death or serious injury of any minor employee, and such assessments may be doubled when the violations are determined to be willful or repeated. The law also prohibits retaliating against or discharging workers who file a complaint or participate in any proceeding under the FLSA.

ADDITIONAL INFORMATION

- Certain occupations and establishments are exempt from the minimum wage, and/or overtime pay provisions.
- Special provisions apply to workers in American Samoa, the Commonwealth of the Northern Mariana Islands, and the Commonwealth of Puerto Rico.
- Some state laws provide greater employee protections; employers must comply with both.
- Some employers incorrectly classify workers as “independent contractors” when they are actually employees under the FLSA. It is important to know the difference between the two because employees (unless exempt) are entitled to the FLSA’s minimum wage and overtime pay protections and correctly classified independent contractors are not.
- Certain full-time students, student learners, apprentices, and workers with disabilities may be paid less than the minimum wage under special certificates issued by the Department of Labor.



WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd



Section 3 Contractor's Packet

Form 4-T

The following CDBG Section 3 Contractor's Packet should be included in all construction contracts, for awarded CDBG projects more than \$200,000.

The Section 3 Contractor's Packet includes the following:

1. Section 3 Contractor's Plan	Form 9-B3
2. Contractor Permanent Workforce	Form 9-M
3. Section 3 Worker Targeted Worker Certificate	Form 9-L
4. Section 3 Contractor Labor Hours Tracking	Form 9-N
5. Section 3 Clause	Form 4-Q (included in 4R)

SECTION 3 CONTRACTOR PLAN

(Contractor) agrees, to the greatest extent feasible, to implement affirmative steps to comply with the Section 3 requirements set forth at 24 CFR 75 directed at increasing the utilization of lower income residents and businesses within the **City/County/Township/Village** of _____.

- A. To implement Section 3 requirements by seeking the assistance of local officials in determining the exact boundaries of the applicable project area.
- B. To attempt to recruit from within the City/County/Township/Village lower income workers if new employees are needed. Recruitment may be done through local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within or serving the project area.
- C. To insert this Section 3 Contractor Plan and the Section 3 Contractor's Packet (Form 4-T) in all bid documents, and to require all bidders/contractors and subcontractors to insert in their contracts. If new employees are needed, contractors are to submit a Section 3 affirmative action plan including utilization goals and the specific steps planned to accomplish these goals.
- D. To maintain records, including copies of correspondence, memoranda, etc., which document that all the above affirmative action steps have been taken. See Section 3 Contractor & Worker Solicitation (Form 9-D) as an example of a record keeping document.
- E. To list all permanent workforce for this project by job title. See Contractor Permanent Workforce Plan (Form 9-M).
- F. To list all projected workforce needs for this project by job classification and time frame for potential hire.
- G. To complete and submit the required Section 3 Forms to municipality for MEDC reporting (Form 9-N).

As representative of _____ (Bidder), the undersigned has read and fully agree to the above and become a party to the full implementation of this program.

Signature		Date
Print Name		
Title		
Company Name		

CONTRACTOR PERMANENT WORKFORCE

This form is provided at contract signing to identify the employees already employed by the bidding contractor/subcontractor. It also needs to be updated at Completion of 9-O. The form will be used to determine the base number of employees and help identify Section 3 Workers.

Contractor/Company Name	
County (project location)	
80% Area Median Income (AMI) Limit (1 person)	\$

	EMPLOYEE NAME	JOB TITLE	ANNUAL SALARY	*IS SALARY AT OR BELOW 80% AMI? (listed above) YES or NO	IS EMPLOYEE CERTIFIED SECTION 3 WORKER? YES OR NO
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

*If Yes, Employee is a Certified Section 3 Worker.

I certify the above employees are permanent employees of _____. I certify the above employees are on our regular payroll and have their W-2 tax forms for our records. If requested, these records will be available to the **County/City/Township/Village Name** for the above referenced project for verification purposes. I understand that falsifying information is perjury and subject to legal ramifications.

Signature:	Date:
Print Name, Title	

TARGETED SECTION 3 WORKER CERTIFICATION

If an employee has been identified as Section 3 worker, please have the employee complete this form to determine if he/she is a Targeted Section 3 employee as defined in Section 75.5.

Date:	
Worker Name:	
Worker Address:	

To meet the income qualifications, the Worker must earn at or below of the 80% AMI income limit.	
80% AMI Income Limit (1 person)	\$

TARGETED SECTION 3 WORKER

Place a check mark beside all the following that apply:	
☐	My income is at or below the 80% AMI listed above.
☐	I work for a Section 3 business
☐	I am a YouthBuild participant.
☐	I reside in public housing or Section 8-assisted housing.
☐	I reside within 1 mile of the worksite. If fewer than 5,000 people live within one mile of a work site, within a circle centered on the work site that is sufficient to encompass a population of 5,000 people according to the most recent U.S. Census.

I hereby certify that the information provided by me to be true and correct and understand any falsification of any of the information could subject me to disqualification from participation and punishment under the law.	
Signature of Worker	Date
Printed Name	

I hereby certify that the above information was provided by the employee as true and accurate.	
Signature of Contractor/Employer	Date
Printed Name	

SECTION 3 LABOR HOURS TRACKING

UGLG Name	
Grant #	
Project Name	
Contractor Name	
Date	

	Number	%
Total Labor Hours for Project	0.00	
Section 3 Worker Hours	0.00	
Targeted Section 3 Worker Hours	0.00	

FALSE = Targeted Section 3 cannot be YES if Section 3 is NO, correction is required.

	Worker Name	Section 3 Worker	Targeted Section 3 Worker	SECTION 3 CHECK	TOTAL HOURS 0.00	Week #	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6
						Payroll #						
						Tot Wk Hrs	0.00	0.00	0.00	0.00	0.00	0.00
1				TRUE	0.00							
2				TRUE	0.00							
3				TRUE	0.00							
4				TRUE	0.00							
5				TRUE	0.00							
6				TRUE	0.00							
7				TRUE	0.00							
8				TRUE	0.00							
9				TRUE	0.00							
10				TRUE	0.00							
11				TRUE	0.00							
12				TRUE	0.00							
13				TRUE	0.00							
14				TRUE	0.00							
15				TRUE	0.00							
16				TRUE	0.00							
17				TRUE	0.00							
18				TRUE	0.00							
19				TRUE	0.00							

SAFE HARBOR

UGLG NAME	0
GRANT #	0
PROJECT NAME	0
CONTRACTOR NAME	0
DATE	

Pursuant to 24 CFR 75.23, Safe Harbor reporting is required if Section 3 benchmarks are not met.

Enter "X" for each applicable item below.

1	☐	Engaged in outreach efforts to generate job applicants who are Targeted Section 3 workers.
2	☐	Provided training or apprenticeship opportunities.
3	☐	Provided technical assistance to help Section 3 workers compete for jobs (e.g., resume assistance, coaching).
4	☐	Provided or connected Section 3 workers with assistance in seeking employment including: drafting resumes, preparing for interviews, and finding job opportunities connecting residents to job placement services.
5	☐	Held one or more job fairs.
6	☐	Provided or referred Section 3 workers to services supporting work readiness and retention (e.g., work readiness activities, interview clothing, test fees, transportation, child care).
7	☐	Provided assistance to apply for/or attend community college, a four-year educational institution, or vocational/technical training.
8	☐	Assisted Section 3 workers to obtain financial literacy training and/or coaching.
9	☐	Engaged in outreach efforts to identify and secure bids from Section 3 business concerns.
10	☐	Provided technical assistance to help Section 3 business concerns understand and bid on contracts.
11	☐	Divided contracts into smaller jobs to facilitate participation by Section 3 business concerns.
12	☐	Provided bonding assistance, guarantees, or other efforts to support viable bids from Section 3 business concerns.
13	☐	Promoted use of business registries designed to create opportunities for disadvantaged and small businesses.
14	☐	Outreach, engagement, or referrals with the state one-stop system as defined in Section 121(e)(2) of the Workforce Innovation and Opportunity Act.
15	☐	Other:

SIGN:

TYPE: Business Owner or Designee Name

Conditions for Approval: (List all mitigation measures adopted by the responsible entity to eliminate or minimize adverse environmental impacts. These conditions must be included in project contracts and other relevant documents as requirements). [24 CFR 58.40(d), 40 CFR 1505.2(c)]

The temporary impact of construction activities will be minimized through mitigation measures specified in the contract documents. Adverse impacts on historical, archaeological, geographic, or cultural areas are not expected.

Historic Properties

An application for Section 106 Review was completed and submitted to SHPO for review and concurrence. The Port Austin Gymnasium is eligible for listing in the National Register of Historic Places for its association with the educational and recreational history of Port Austin beginning in 1939 when the building was completed. There are no other historic properties within the indirect APE. Demolition of the historic gymnasium is an Adverse Effect. Further consultation with SHPO and other parties will be necessary to resolve the adverse effect under 800.6.

Coastal Zone Management

The Project is located in a coastal zone. In Michigan, Coastal Zone Management Act consistency for a federally funded project is based on the project being authorized under the required EGLE permits. Based on EGLE communications, certification of consistency with the Michigan Coastal Management Program (MCMP) requires evaluation of a project to determine if it will have an adverse impact on coastal land or water uses or coastal resources. Projects are evaluated using the permitting criteria contained in the regulatory statutes administered by EGLE. These statutes constitute the enforceable policies of the MCMP. Provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated from this project as described in the information forwarded to the WRD.

Solid Waste Disposal

The Project will comply with local, state and federal solid waste disposal requirements. The Project is revitalization of an existing municipally owned property, including demolition of an existing community building and redevelopment of a new four seasons structure. A Pre-Demolition Hazardous Materials Assessment report was prepared by SME dated May 2023 to assist with identification of potential hazardous materials (including asbestos, lead/cadmium paint, PCBs, mercury) and universal waste items prior to demolition of the building.

SECTION 02 41 13.13
PAVEMENT REMOVAL

PART 1 - GENERAL

1.01 Work Included

This work includes removal of an existing pavement, including streets, driveways, sidewalks, and parking areas. For purposes of the work "pavement removal", pavement material may include HMA, concrete, brick, or any combination thereof, including any reinforcement materials.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Limits of Removal

Pavement shall be removed to the limits shown on the plans, or as directed by the Owner. Where pavement is to be removed to allow for the construction of utilities or other improvements, pavement shall be removed to the limits required for their construction.

3.02 Pavement Removal

Pavement shall be removed to an existing joint or to a sawed joint. An existing crack is not suitable for the limit of removal. Sawed joints for pavement removal are to be either parallel or perpendicular to the longitudinal centerline. Sawed joints shall extend substantially through the full thickness of the pavement so that a "clean break" is made and that the adjacent pavement or structures that are to remain are not damaged. If adjacent pavement or structures that are to remain are damaged as a result of the Contractor's removal operations, they shall be replaced to the Owner's satisfaction at the Contractor's expense.

Broken concrete, HMA, brick, and other debris resulting from pavement removal operations shall become the Contractor's property and disposed of properly.

Where pavements are encountered that are composed of more than one material or multiple courses of the same material, the pavement shall be removed in its entirety and all components shall be considered part of the same pavement area.

The Contractor shall provide sufficient barricades and fences to protect pedestrians and vehicles from hazardous areas.

END OF SECTION

2SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.
- C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
- D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.6 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1).

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301 (ACI 301M).
 - 2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

- 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 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture

bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) foundations; 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C 260/C 260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

E. Water: ASTM C 94/C 94M.

2.5 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572 for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.6 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: As indicated on the drawings at 28 days.
 - 2. Maximum W/C Ratio: As indicated on the drawings.
 - 3. Slump Limit: As indicated on the drawings. before adding high-range water-reducing admixture or plasticizing admixture.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.10 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.12 CONCRETE FINISHING

- A. Product: Subject to compliance with requirements provide water-based sealer from Curecrete Distribution, Inc.
 1. Contact: 1203 W. Spring Creek Place, Springville, UT 84663-0551; Telephone: (800) 998-5664, (801) 489-5663; Fax: (801) 489-3307; Email: info@ashfordformula.com; Website: www.ashfordformula.com.
- B. Cure-Seal-Hardener: Ashford Formula, a water-based, chemically reactive penetrating sealer and hardener that densifies concrete to seal against water molecules, but allows air and water vapor to pass, so that concrete can achieve full compressive strength for minimized surface crazing and elimination of dusting.
 1. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
 2. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.
 3. Hardening: As follows when tested in accordance with ASTM C39.
 - a. After 7 Days: An increase of at least 40% over untreated samples.
 - b. After 28 Days: An increase of at least 38% over untreated samples.
 4. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C1028.
 5. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.
 6. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated.
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.5 WATERSTOP INSTALLATION

- A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE FINISHING APPLICATION

- A. New Concrete: Apply cure-seal hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.
 1. Spray on at rate of 200 ft²/gal (5 m²/L).
 2. Keep surface wet with cure-seal-hardener for a minimum soak-in period of 30 minutes without allowing it to dry or become slippery. If slipperiness occurs before the 30 minute time period has elapsed, apply additional cure-seal-hardener, as needed, to keep the entire surface in a non-slippery state for the first 15 minutes; for the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state. In hot weather conditions, follow manufacturer's special application procedures.
 3. When the treated surface becomes slippery after this period, lightly mist with water until slipperiness disappears.
 4. Wait for surface to become slippery again, and then flush entire surface with water to remove all cure-seal-hardener residue.
 5. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
 6. Wet vacuum or scrubbing machines can be used in accordance with manufacturer's instructions to remove residue.
- B. Protect installed floors for at least 3 months until chemical reaction process is complete.
 1. Do not allow traffic on floors for 3 hours after application.
 2. Do not allow parking of vehicles on concrete slab.
 3. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
 4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
 5. Do not allow temporary placement and storage of steel members on concrete slabs.
 6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
 7. Clean floor regularly in accordance with manufacturer's recommendations.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to

manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

3.11 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.12 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
- C. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
- D. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include data on material properties.
- B. 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/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups. Provide Masonry mock up (roughly 10'-0" wide x 15'-0" high) that includes a composite of all masonry products specified including joints, trims, coursings, reveals and bond patterns as indicated on exterior elevations.

1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa)
 - 2. Density Classification: Normal weight.

2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 - 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Belden architectural elements,
 - 1) Glen Gery HERITAGE S Modular V
(final selection to be verified to field match).
 - 2. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67.
 - 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 4. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
 - 5. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (397 mm) long.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, 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.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

- F. Mixes in "Colored Cement Products" Paragraph below allow better control of color than job-mixed colored mortar. If retaining, also retain paragraphs above that specify materials included in the mixes retained below.
- G. Aggregate for Mortar: ASTM C 144.
 - 1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 2. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.
- I. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- J. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- K. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60
- B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Exterior Walls: Hot-dip galvanized carbon steel.
 - 2. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry-Joint Reinforcement for Multiwythe Masonry:
 - 1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus one side rod at each wythe of masonry 4 inches (100 mm) wide or less.

2.6 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, provide products by one of the following:
 - a. Diedrich Technologies, Inc.; a division of Sandell Construction Solutions.

- b. EaCo Chem, Inc.
- c. PROSOCO, Inc.

2.7 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 or masonry cement 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. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the types of mortar for applications stated as shown on the drawings.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Calcium silicate brick
 - b. Clay face brick.
- E. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1.
 - 3. Provide grout with a slump of 8 to 11 inches

2.8 CAVITY WALL AIR AND VAPOR BARRIER

- A. Fluid applied, one component, latex based membrane that cures to form a resilient, monolithic, fully bonded elastomeric sheet.
- B. Basis-of-Design: Perm-A-Barrier NPL10 as manufactured by Grace Construction.
 - 1. Minimum wet thickness: 70 mils (40 mils dry).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. 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.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 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.
- 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 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).
 - 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 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. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Lay structural clay tile as follows:
 - 1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
 - 2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
 - 3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- (6- to 10-mm-) thick joints.
- D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
 - 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. 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 continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 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 that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 12.67 ft. (3.86 m).

3.7 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.8 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. 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.
 - 3. Protect adjacent surfaces from contact with cleaner.
 - 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 masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.9 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 044313.16 - ADHERED STONE MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stone masonry adhered to unit masonry backup.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for concealed flashing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Samples:
 - 1. For each stone type indicated.
 - 2. For each color of mortar required.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has with documented experience in installation of stone masonry including a minimum of five projects within 100 mile radius of Project, and whose work has resulted in construction with a record of successful in-service performance.
- B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for typical exterior walls in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness.

1.4 FIELD CONDITIONS

- A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried.
- C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Installation of stone masonry veneer at exterior locations over continuous insulation shall be installed in accordance with Technical Evaluation Report 1312-01, as prepared by DrJ Engineering, LLC, updated March 29, 2018; www.drjengineering.org.

2.2 NATURAL VENEER STONE

- A. Material Standards:
 - 1. Maximum Absorption according to ASTM C 97/C 97M: 3 percent.
 - 2. Minimum Compressive Strength according to ASTM C 170/C 170M: 7500 psi.
 - B. Varieties and Sources: Subject to compliance with requirements, available stone varieties that may be incorporated into the Work include, but are not limited to, the following:
 - CULTURED STONE
 - Black Rundle Pro Fit Alpine Ledgestone
 - Contact: Dennis Hoffman - Belden Brick - 989.487.4453
1. Request for substitutions will be considered in accordance with Section 012500.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
 - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in stone masonry mortar.
- E. Colored Portland Cement-Lime Mix: Packaged blend of portland cement, hydrated lime, and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 10 percent of portland cement by weight.
- F. Colored Masonry Cement Mix: Packaged blend of masonry cement and mortar pigments. Mix shall produce color indicated or, if not indicated, as selected from manufacturer's standard colors. Pigments shall not exceed 5 percent of masonry cement by weight.
- G. Aggregate: ASTM C 144 and as follows:
 - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
 - 2. White Aggregates: Natural white sand or ground white stone.
 - 3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- H. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
- I. Water: Potable.

2.4 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch (0.4 mm) thick.
- B. Flexible Flashing: For flashing unexposed to the exterior, use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. (2-kg/sq. m) copper sheet bonded with asphalt between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. 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 .040 inch (1.0 mm).

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Rainscreen Drainage Plane: Maintains separation between thin veneer cementitious materials and moisture resistance system on structural substrates creating drainage plane system for cavity moisture to drain down and out of wall.
 1. High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and a spunbond polypropylene fabric, charcoal color, attached on one side with a 4 inch (102mm) overlapping skirt on one edge.
 - a. Manufacturer:
 - 1) Masonry Technology, Inc.
 - b. Product:
 - 1) SURE CAVITY. (SC5032)
- B. Weep Products: Use the following unless otherwise indicated:
 1. Weep Screed: A sheet metal device that creates a bottom of adhered thin brick, thin manmade stone, thin natural stone and three course stucco veneer wall termination detail, that encapsulates and weeps the bottom edge of the WRB, the bottom edge of the rainscreen drainage plane Sure Cavity SC5032.
 - a. Manufacturer:
 - 1) Masonry Technology, Inc.
 - b. Product:
 - 1) L & R Weep Screed. (LR3501)
- C. Expanded Metal Lath: 3.4 lb/sq. yd. (1.8 kg/sq. m), self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60 (Z180).

2.6 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.7 MORTAR 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.
 2. Use portland cement-lime mortar unless otherwise indicated.
 3. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small

portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Mortar for Setting Stone: Type N.
 - 2. Mortar for Pointing Stone: Type N.
- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- D. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
 - 1. For latex-modified portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- E. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.
- F. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.

PART 3 - EXECUTION

3.1 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
 - 1. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
 - 2. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in broken-range ashlar pattern with uniform course heights, random lengths, and uniform joint widths.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Maintain uniform joint widths, except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any.
- F. Provide sealant joints of widths and at locations indicated.
 - 1. Keep sealant joints free of mortar and other rigid materials.
 - 2. Sealant joints are specified in Section 079200 "Joint Sealants."
- G. Install embedded flashing and weeps where indicated.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

3.3 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install lath over insulation board by fastening through insulation board into masonry backup wall. Install fasteners at 16" o.c. horizontal and 7" o.c. vertical maximum spacing, or as otherwise required to meet specified performance requirements. Fasteners shall achieve a minimum 1" penetration into masonry.
- B. Install scratch coat over metal lath 3/8 inch (10 mm) thick to comply with ASTM C 926.
- C. Coat backs of stone units and face of scratch coat with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar, so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and scratch coat.
- D. Rake out joints for pointing with mortar to depth of not less than 3/4 inch (19 mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly, and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: below edges of stone (raked joint).

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 5. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

3.6 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.

1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

END OF SECTION 044313.16

SECTION 047200 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes cast sills.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For cast-stone units, include dimensions and finishes.
- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
- C. Samples:
 - 1. For each color and texture of cast stone required.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.

PART 2 - PRODUCTS

2.1 CAST-STONE UNITS

- A. BASIS FOR DESIGN:
 - 1. SHOULDICE DESIGNER STONE
Newport - Silverado
Contact: Dennis Hoffman - Belden Brick 989.487.4453
- B. Cast-Stone Units: Comply with ASTM C 1364.
 - 1. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
 - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 - 2. Provide drips on projecting elements unless otherwise indicated.
- D. Cure Units as Follows:
 - 1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F (38 deg C) for 12 hours or 70 deg F (21 deg C) for 16 hours.
 - 2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of 70 deg F (21 deg C) or above.
 - b. No fewer than six days at mean daily temperature of 60 deg F (16 deg C) or above.

- c. No fewer than seven days at mean daily temperature of 50 deg F (10 deg C) or above.
- d. No fewer than eight days at mean daily temperature of 45 deg F (7 deg C) or above.
- E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- F. Colors and Textures: As indicated on Drawings.

2.2 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, or steel complying with ASTM A 36/A 36M and hot-dip galvanized to comply with ASTM A 123/A 123M.
- B. Dowels: 1/2-inch- (12-mm-) diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666 or steel complying with ASTM A 36/A 36M and hot-dip galvanized to comply with ASTM A 123/A 123M.
- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.3 MORTAR

- A. Comply with requirements in Section 042000 "Unit Masonry" for mortar mixes.
 - 1. For setting mortar, use Type N.
 - 2. For pointing mortar, use Type N.

2.4 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast-stone units according to ASTM C 1364.
 - 1. Include one test for resistance to freezing and thawing.

PART 3 - EXECUTION

3.1 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Set units in full bed of mortar with full head joints unless otherwise indicated.
 - 1. Fill dowel holes and anchor slots with mortar.
 - 2. Fill collar joints solid as units are set.
 - 3. Build concealed flashing into mortar joints as units are set.
 - 4. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
- C. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- D. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- E. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- F. Rake out joints for pointing with sealant to depths of not less than 3/4 inch (19 mm). Scrub faces of units to remove excess mortar as joints are raked.

- G. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
 - 1. Keep joints free of mortar and other rigid materials.
 - 2. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.2 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 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.
- B. Variation from Level: Do not exceed 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.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except where variation is due to warpage of units within tolerances specified.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 047200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Shelf angles.
3. Miscellaneous steel trim.
4. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design ladders.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- G. Zinc-Coated Steel Wire Rope: ASTM A 741.
 - 1. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: As indicated.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, with G90 (Z275) coating.
- I. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- J. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- L. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.

4. Provide bronze fasteners for fastening bronze.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 1. 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.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1 (A1)] [Group 2 (A4)] stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).
- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not

more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.

2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Galvanize loose steel lintels located in exterior walls.

2.10 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.11 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer.
- C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

END OF SECTION 055000

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
4. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
6. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
7. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
 2. Apply AWI Quality Certification Program label to Shop Drawings.
- D. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program.
- B. Research reports.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
1. Shop Certification: AWI's Quality Certification Program accredited participant.
- B. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of cabinets indicated for construction, finishes, installation, and other requirements.
1. Provide inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
- B. Grade: Premium.
- C. Regional Materials: Wood products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- D. Certified Wood: Wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001 and FSC STD-40-004.
- E. Type of Construction: Face frame.
- F. Door and Drawer-Front Style: Flush overlay.
- G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Pionite; a Panolam Industries International, Inc. brand.
 - e. Wilsonart LLC.

H. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 100 percent.

C. Composite Wood Products: Products shall be made without urea formaldehyde.

D. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard: ANSI A208.1, Grade M-2.

3. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
4. Softwood Plywood: DOC PS 1, medium-density overlay.
5. Thermoset Decorative Panels: Particleboard or MDF 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.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- B. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- C. Catches: Magnetic catches, BHMA A156.9, B03141.
- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- E. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- F. Drawer Slides: BHMA A156.9.
 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
 6. For computer keyboard shelves, provide Grade 1HD-100.
 7. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-200.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Door and Drawer Silencers: BHMA A156.16, L03011.
- J. Grommets for Cable Passage: 2-inch (51-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
 1. Color: As selected by Architect from manufacturers full range.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Grade: Install cabinets to comply with quality standard grade of item to be installed.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings

- and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

END OF SECTION 064116

SECTION 072430 - EXTERIOR FINISH SYSTEM FOR SOFFITS AND CEILINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Provide textured finish system for exterior gypsum or cement board soffit and ceiling surfaces.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Samples: For each type of factory-prepared finish coat and for each color and texture specified.

1.3 REFERENCES

- A. ASTM C1177, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
- B. South Coast Air Quality Management District (SCAQMD)
Rule 1113, Architectural Coatings

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: The textured finish system manufacturer shall be a company with at least thirty five years of experience in manufacturing specialty finishes and regularly engaged in the manufacture and marketing of products specified herein. The manufacturer shall have an ISO 9001:2008 certified quality system and ISO 14001:2004 certified environmental management system.
- B. Installer's Qualifications: The contractor shall be qualified to perform the work specified by reason of experience. Contractor shall have at least 5 years of experience in commercial textured finish application, and shall have completed at least 3 projects of similar size and complexity. Contractor shall provide proof before commencement of work that he/she will maintain and supervise a qualified crew of applicators through the duration of the work. When requested Contractor shall provide a list of the last three comparable jobs including the name, location, and start and finish dates for the work.
- C. Mock-ups: The contractor shall install a mock-up of the system for evaluation and approval by the design professional, building owner, or owner's representative/quality assurance agent.
- D. Testing: Testing shall be conducted as directed by the design professional, building owner, or owner's representative/quality assurance agent to verify soffit/ceiling assembly performance and adhesion to prepared substrates.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original packaging, labeled with product identification, manufacturer, and batch number.
- B. Store products in a dry area with temperature maintained between 50 and 85 degrees F (10 and 29 degrees C). Protect from direct sunlight. Protect from freezing. Protect from extreme heat (>90 degrees F [32 degrees C]).
- C. Handle products in accordance with manufacturer's printed instructions.

1.6 WARRANTY

- A. Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Sto Corp; Direct-applied Exterior Finish System (DEFS) or a comparable product by one of the following:
 - a. Dryvit Systems, Inc.
 - b. El Rey Stucco Solutions; a Parex USA, Inc. brand.
 - c. Senergy; BASF Corp.

2.2 MATERIALS

- A. Textured Finishes
 - 1. Stolit – high performance decorative and protective acrylic-based textured wall finish with integral color, complies with SCAQMD Rule 1113 for architectural finishes
- B. Primer
 - 1. StoPrime™ Sand – acrylic-based sanded primer, complies with SCAQMD Rule 1113 for primers
- C. Base Coat
 - 1. Sto BTS Plus – one component polymer modified portland cement high build base coat
- D. Surface Reinforcement
 - 1. Sto Mesh – nominal 4.5 oz/yd² (153 g/m²) glass fiber reinforcing mesh treated for compatibility with Sto materials
 - 2. Sto Detail Mesh – nominal 4.2 oz/yd² (142 g/m²) glass fiber reinforcing mesh treated for compatibility with Sto materials
 - 3. StoGuard Mesh – nominal 4.2 oz/yd² (142 g/m²) self-adhesive glass fiber reinforcing mesh treated for compatibility with Sto materials

E. Gypsum Soffit Board

1. DensGlass[®] glass mat faced gypsum sheathing in compliance with ASTM C1177

PART 3 EXECUTION

3.1 INSTALLATION

A. General Surface Preparation

- B. Gypsum or cement soffit board must be installed in conformance with the applicable building code and manufacturer's written installation instructions. Gypsum or cement soffit board surface must be clean, dry, and free of surface contamination. Soffit board surface shall not have planar irregularities in excess of 1/16 inch (1.6 mm) and shall be free of voids, cracks, and other surface defects.

C. Mixing

1. Mix Sto products in accordance with published literature. Refer to applicable Product Bulletins for specific information on use, handling, application, precautions, and limitations of specific products.

D. Application

1. Install corrosion proof termination accessories with perforated flanges for keying of the base coat at junctures with penetrations such as soffit vents, electrical fixtures, and with abutting walls and columns. Install corrosion proof control joints with perforated flanges for keying of the base coat at intervals as required by the soffit board manufacturer. Refer to Sto Guide details.
2. Reinforce perforated flanges of accessories with minimum 4 inch (102 mm) wide strips of Sto Detail Mesh or Sto Mesh embedded in base coat. Where cement board is used tape joints between boards with minimum 4 inch (102 mm) wide StoGuard Mesh and skim with base coat. Alternatively tape joints with minimum 4 inch (1023 mm) wide Sto Mesh or Sto Detail mesh embedded in base coat. Allow base coat to dry.
3. Install nominal 1/8 inch (3 mm) base coat by trowel to the soffit/ceiling board surface. Work horizontally or vertically in strips of 40 inches (1016 mm), and immediately embed the Sto Mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh installed at perforated accessory flanges by installing Sto Mesh up to the termination bead of the accessory. Overlap mesh not less than 2-½ inches (64 mm) at mesh seams and feather at seams. Double wrap all inside and outside corners with minimum 8-inch (203 mm) overlap in each direction (except where corner bead is used at outside corners lap mesh over perforated flange of accessory). Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through the base coat when it is dry. Re-skim with additional base coat if mesh color is visible. Do not install base coat and mesh onto solid (unperforated) portions of accessories.
4. When the base coat application is dry apply the primer by brush or roller to the entire base coat surface.

5. When the primer application is dry apply the textured finish by trowel. Apply finish in a continuous application, and work to a wet edge. Float the finish to achieve the desired texture.

E. Protection

1. Provide protection of installed materials from water infiltration into or behind them during and after construction.
2. Provide protection of installed materials from dust, dirt, precipitation, freezing and continuous high humidity until they are fully dry.
3. Seal penetrations through the finished surface with backer rod and sealant or other appropriate means.

END OF SECTION 072430

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fiber-cement siding and soffit.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For fiber-cement siding and soffit including related accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Research/evaluation reports.
- D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Basis-of-Design Product:
 - a. Allura of Plycem; Houston, TX; www.alluraUSA.com.
 - b. Subject to compliance with requirements, provide a comparable product by one of the following:
 - 1) CertanTeed Corporation; Malvern, PA; www.certanteed.com.
 - 2) James Hardie Building Products, Inc.; Mission Viejo, CA; www.jameshardie.com.
 - 3) Architect approved equal.
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

- C. Nominal Thickness: Not less than 5/16 inch (8 mm).
- D. Horizontal Pattern: Boards 5-1/4 inches (133 mm) wide lap siding.
 - 1. Texture: Smooth.
- E. Factory Finish: Manufacturer's standard factory applied acrylic finishing system, color as selected by Architect from Manufacturer's full range.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
 - 1. Manufacturer: Provide product from same manufacturer as siding.
- B. Nominal Thickness: Not less than 5/16 inch (8 mm).
- C. Pattern: 24-inch- (600-mm-) wide sheets with smooth texture.
- D. Combination of ventilated and non-ventilated panels as indicated on Drawings
- E. Factory Finish: Manufacturer's standard factory applied acrylic finishing system, color as selected by Architect from Manufacturer's full range.

2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
- B. Trim: Provide trim boards at inside corners, outside corners, door and window openings, fascia, beltline, frieze boards, and other areas as indicated on Drawings.
 - 1. Size: 5/4", dimensions as indicated on Drawings.
- C. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
 - 1. Finish for Aluminum Flashing: High-performance organic finish.
- D. Fasteners:
 - 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
 - 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
 - 3. For fastening fiber cement, use hot-dip galvanized fasteners.
- E. Insect Screening for Soffit Vents: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Install fasteners no more than 24 inches (600 mm) o.c.
- B. Over masonry walls: Install furring strips of adequate thickness to accept full length of nails and spaced at 16 inches on center.
- C. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- E. Furred Installation: Leave space at top and bottom open; top may be behind soffit; at bottom install insect screen over opening by wrapping a strip of screen over bottom of ends of vertical furring strips.

- F. Install sheet metal flashing above door and window casings and horizontal trim in field of siding.
- G. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- H. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.
- I. Paint all exposed cut edges to match siding finish.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- C. Samples: For each kind and color of joint sealant required.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

- B. Preconstruction laboratory test reports.

- C. Preconstruction field-adhesion-test reports.

- D. Field-adhesion-test reports.

- E. Sample warranties.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period for Horizontal Applications: 5 years from date of Substantial Completion.
 - 2. Warranty Period for Vertical Applications: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. VOC Content: Sealants and sealant primers shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.

3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- 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. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant, Acid-Curing Silicone Joint Sealant SS-1: ASTM C 920.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation.
 - b. GE Advanced Materials - Silicones.
 - c. Tremco Incorporated.
 - d. Sika Corporation: SikaSil GP
 2. Type: Single component (S).
 3. Grade: nonsag (NS).
 4. Class: 25.
 5. Uses Related to Exposure: Nontraffic (NT).
- B. Neutral-Curing Silicone Joint Sealant SS-2: ASTM C 920.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Corning Corporation; 795.
 - b. GE Silicones; Silglaze II SCS2800.
 - c. Tremco; Spectrem 2.
 - d. Pecora Corporation; Pecora 895
 - e. Sika Corporation; SikaSil WS 295
 2. Type: Single component (S).
 3. Grade: nonsag (NS).
 4. Class: 25.
 5. Uses Related to Exposure: Nontraffic (NT).

2.3 LATEX JOINT SEALANTS

- A. Latex Joint Sealant LS-1: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NS.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pecora Corporation.
 - b. Sonneborn, Division of BASF.; Sonolac.
 - c. Tremco Incorporated.

2.4 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) 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.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 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.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 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 laitance and form-release agents from concrete.
 2. 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.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. 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.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- 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 to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 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 3 tests for the first 300 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each 300 feet of joint length thereafter or one test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- 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.

3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces US-1.
 - 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - 2. 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 SS-2.
 - 1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Joints in glass unit masonry assemblies.
 - c. Joints between metal panels.
 - d. Perimeter joints between materials listed above and frames of doors windows and louvers.
 - e. Control and expansion joints in ceilings and other overhead surfaces.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces US-1.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces SS-2 or LS-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. Vertical joints on exposed surfaces of interior unit masonry and partitions.
 - d. Joints on underside of plant-precast structural concrete beams and planks.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces SS-1.
 - 1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints in toilet rooms.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081743 - FRP FLUSH DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fiberglass reinforced polyester (FRP) flush doors with aluminum frames.

1.5 SUBMITTALS

- A. Comply with Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, and installation.
- C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
- D. Samples:
 - 1. Door: Submit manufacturer's sample of door showing face sheets, core, framing, and finish.
 - 2. Color: Submit manufacturer's samples of standard colors of doors and frames.
- E. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- F. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- G. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 10 years successful experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.8 WARRANTY

- A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
- B. Warranty Period: Ten years starting on date of shipment. In addition, a limited lifetime (while the door is in its specified application in its original installation) warranty covering: failure of corner joinery, core deterioration, delamination or bubbling of door skin.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Special-Lite, Inc.

2.2 FRP FLUSH DOORS

- A. Model: SL-17 Flush Doors with SpecLite3 fiberglass reinforced polyester (FRP) face sheets.
- B. Door Opening Size: As indicated on the Drawings.
- C. Construction:
 - 1. Door Thickness: 1-3/4 inches.
 - 2. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
 - 3. Corners: Mitered.
 - 4. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
 - 5. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable.
 - 6. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
 - 7. Rail caps or other face sheet capture methods are not acceptable.
 - 8. Extrude top and bottom rail legs for interlocking continuous weather bar.
 - 9. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
 - 10. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.

11. Glue: Use of glue to bond sheet to core or extrusions is not acceptable.
- D. Face Sheet:
 1. Material: SpecLite3 FRP, 0.120-inch thickness, finish color throughout.
 2. Protective coating: Abuse-resistant engineered surface. Provide FRP with SpecLite3 protective coating, or equal.
 3. Texture: Pebble.
 4. Color: As selected by Architect from manufacturer's standard colors.
 5. Adhesion: The use of glue to bond face sheet to foam core is prohibited.
- E. Core:
 1. Material: Poured-in-place polyurethane foam.
 2. Density: Minimum of 5 pounds per cubic foot.
 3. R-Value: Minimum of 9.
- F. Cutouts:
 1. Manufacture doors with cutouts for required vision lites.
 2. Factory install vision lites, louvers, and panels.
- G. Hardware:
 1. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

2.3 MATERIALS

- A. Aluminum Members:
 1. Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes: ASTM B 221.
 2. Sheet and Plate: ASTM B 209.
 3. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.
- B. Components: Door and frame components from same manufacturer.
- C. Fasteners:
 1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.

2. Compatibility: Compatible with items to be fastened.
3. Exposed Fasteners: Screws with finish matching items to be fastened.

2.4 FABRICATION

- A. Sizes and Profiles: Required sizes for door and frame units, and profile requirements shall be as indicated on the Drawings.
- B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements on shop drawings.
- C. Assembly:
 1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 2. Remove burrs from cut edges.
- D. Welding: Welding of doors or frames is not acceptable.
- E. Fit:
 1. Maintain continuity of line and accurate relation of planes and angles.
 2. Secure attachments and support at mechanical joints with hairline fit at contacting members.

2.5 ALUMINUM DOOR FRAMING SYSTEMS

- A. Thermally Broken Tubular Framing:
 - a. Model: Special-Lite SL-600TB
1. Size and Type: As indicated on the Drawings.
2. Materials: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T5 alloy recovered from industrial processes, 1/8-inch minimum wall thickness.
3. Applied Door Stops: 0.625-inch high, with screws and weatherstripping. Door stop shall incorporate pressure gasketing for weathering seal. Counterpunch fastener holes in door stop to preserve full metal thickness under fastener head.
4. Frame Members: Box type with 4 enclosed sides. Open-back framing is not acceptable.
5. Caulking: Caulk joints before assembling frame members.
6. Joints:
 - a. Secure joints with fasteners.
 - b. Provide hairline butt joint appearance.

7. Field Fabrication: Field fabrication of framing using stick material is not acceptable.
8. Applied Stops: For side, transom, and borrowed lites and panels. Applied stops shall incorporate pressure gasketing for weathering seal. Reinforce with solid bar stock fill for frame hardware attachments.
9. Hardware:
 - a. Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and hardware schedule.
10. Anchors:
 - a. Anchors appropriate for wall conditions to anchor framing to wall materials.
 - b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
 - c. Secure head and sill members of transom, side lites, and similar conditions

2.6 HARDWARE

- A. Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.

2.7 ALUMINUM FINISHES

- A. Anodized Finish: Class I finish, 0.7 mils thick (Refer to drawings for location of finishes)
 1. Clear 215 R1, AA-M10C12C22A41, Class I, 0.7 mils thick.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.
- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.

- E. Set thresholds in bed of mastic and backseal.
- F. Install exterior doors to be weathertight in closed position.
- G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
- H. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.7 PROTECTION

- A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 083613 - SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Insulated Sectional Overhead Doors.

1.2 REFERENCES

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.
- B. ASTM A 123 - Zinc hot-dipped galvanized coatings on iron and steel products.
- C. ASTM A 216 - Specifications for sectional overhead type doors.
- D. ASTM A 229 - Steel wire, oil-tempered for mechanical springs.
- E. ASTM A 653 - Steel sheet, zinc-coated galvanized by the hot-dipped process, commercial quality.
- F. ASTM D 1929 - Ignition temperature test to determine flash and ignition temperature of foamed plastics.
- G. ASTM E 84 - Tunnel test for flame spread and smoke developed index.
- H. ASTM E 330 - Structural performance of exterior windows, curtain walls, and doors by uniform static air pressure difference.
- I. ASTM E 413 - Classification for Rating Sound Insulation
- J. ASTM E 1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- K. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

1.3 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.
 - 1. Design pressure : As indicated on structural drawings
 - 2.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- E. Operation and Maintenance Data.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Protect materials from exposure to moisture until ready for installation.
- C. Store materials in a dry, ventilated weathertight location.

1.7 PROJECT CONDITIONS

- A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.8 WARRANTY

- A. Warranty: Manufacturer's limited door and operators System warranty for 10 years against cracking, splitting or deterioration of steel skin due to rust.

- B. Warranty: Manufacturer's limited door and operators System warranty for 8 years against cracking, splitting or deterioration due to rust-through.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Wayne Dalton; 2501 S. State Highway 121 Business, Suite 200, Lewisville, TX 75067. ASD. Phone: (800) 827-3667; Web Site: www.wayne-dalton.com. Email: info@wayne-dalton.com.
- B. Substitutions: Owner Approved substitutions

2.2 INSULATED SECTIONAL OVERHEAD DOORS

- A. Insulated Steel Commercial Sectional Overhead Doors: ThermoMark 530 Insulated Steel Doors by Wayne Dalton. Units shall have the following characteristics:
 - 1. Door Assembly: Metal/foam/metal sandwich panel construction, with 1-3/4 inch wide PVC thermal break and weather-tight Dual Barrier tongue-in-groove meeting joints.
 - a. Panel Thickness: 3 inches (76.2 mm).
 - b. Exterior Surface: Embossed stucco texture with pinstripes.
 - c. Exterior Steel: .015 inch (.38 mm), hot-dipped galvanized.
 - d. End Stiles: 14 or 16 gauge with thermal break to prevent heat/cold transfer.
 - e. Spring Counterbalance: Sized to weight of the 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.
 - 1) Standard cycle spring: 10,000 cycles
 - 2) High cycle spring: 25,000 cycles.
 - 3) High cycle spring: 50,000 cycles.
 - 4) High cycle spring: 75,000 cycles.
 - 5) High cycle spring: 100,000 cycles.
 - f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
 - g. Thermal Values: Calculated R-value of 26.
 - h. Installed U-factor: 0.14 BTU/hr*ft²*F Provide Test Report Validating Compliance` to NFRC 102
 - i. Air Infiltration: .09 cfm at 15 mph Provide Test Report Validating Compliance to ASTM E-283
 - j. Sound Transmission Rating: STC 22 Provide Test Report Validating Compliance to ASTM E 90
 - k. High-Usage Package: Provide with optional high-usage package (springs, rollers, bearings, and 11 gauge hinges).
 - 1) 50,000 Cycle
 - 2) 100,000 cycle
 - l. Partial Glazing of Steel Panels:
 - 1) Standard with black frame:
 - (a) 1/2 inch (12.5 mm) Insulated.

- (b) 1/2 inch Tempered Insulated.
 - (c) 5/8 inch (15.87 mm) Triple-Wall Polycarbonate (clear, bronze, white).
 - 2) Color matched frame: white, brown, almond, taupe.
- 2. Finish and Color:
 - a. Two coat baked-on polyester:
 - 1) Interior color, white.
 - 2) Exterior color, white.
- 3. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
- 4. Lock:
 - a. Interior mounted slide lock.
- 5. Weatherstripping:
 - a. PVC retainer and dual durometer PVC bulb seal or optional EPDM bulb seal at bottom section.
 - b. Exclusive Advanced Performance Jamb seals (optional).
 - c. Factory installed Flexible Header seal.
- 6. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
 - a. Size:
 - 1) 3 inch (76 mm).
 - b. Type:
 - 1) Follow roof slope.
- 7. Electric Motor Operation: Provide UL listed electric operator, equal to Genie Commercial Operators, 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.
 - a. Heavy Duty
 - 1) Model GH - hoist
 - b. Entrapment Protection: Required for momentary contact, includes radio control operation.
 - 1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
 - 2) Electric sensing edge monitored to meet UL 325/2010 equal to Miller Edge.
 - 3) Photoelectric sensors monitored to meet UL 325/2010.
 - c. Operator Controls:
 - 1) Push-button operated control stations with open, close, and stop buttons.
 - 2) Push-button and key operated control stations with open, close, and stop buttons.
 - 3)
 - 4) Surface mounting.
 - 5) Interior location.
 - d. Special Operation:
 - 1) Commercial light package.

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.
- 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 doors, frames and glass 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. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.

END OF SECTION 083613

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing.
2. Manual-swing entrance doors.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
3. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
4. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

- C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
2. Include point-to-point wiring diagrams.

- D. Samples: For each type of exposed finish required.

- E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

- F. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
- B. Product test reports.
- C. Source quality-control reports.
- D. Field quality-control reports.
- E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by the International Accreditation Service or the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- C. Structural Loads:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.
 - 3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
 - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans of less than 11 feet 8-1/4 inches (3.6 m).
- E. Structural: Test according to ASTM E 330/E 330M as follows:
 - 1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.

2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
2. Entrance Doors:
 - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) as determined according to NFRC 100.
2. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 STOREFRONT SYSTEMS

A. Basis of Design: Subject to compliance with requirements, provide Tubleite T24650 Series or comparable products by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Alcoa company.
3. Oldcastle BuildingEnvelope™.
4. TRACO.
5. YKK AP America Inc.

- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Exterior Framing Construction: Thermally broken.
 - 2. Interior Vestibule Framing Construction: Nonthermal.
 - 3. Glazing System: Retained mechanically with gaskets on four sides.
 - 4. Finish: Clear anodic and Color anodic finish. Refer to drawings for finish locations.
 - 5. Fabrication Method: Field-fabricated stick system.
 - 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 7. Steel Reinforcement: As required by manufacturer.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.
 - 1. Door Construction: 1-3/4-inch (44.5-mm) 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: Wide stile; 5-inch (127-mm) nominal width.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide nonremovable glazing stops on outside of door.

2.4 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

1. Sealant shall have a VOC content of 250 g/L or less.

2.6 MATERIALS

- A. Sheet and Plate: ASTM B 209 (ASTM B 209M).
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.
- E. Steel Reinforcement:
 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
 4. Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
- F. Regional Materials: Products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from exterior.
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

- G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: Dark bronze. Refer to drawings for extent and location of each color.

PART 3 - EXECUTION

3.1 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 nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. 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.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.
 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of two tests in areas as directed by Architect.
- C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes aluminum windows for exterior locations.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: AW.

2. Minimum Performance Grade: 40.
- C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of not less than 62.
- 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: 120 deg F (67 deg C) ambient; 180 deg F (100 deg C) material surfaces.

2.2 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Winco 3600 Series slider
 1. Wausau
 2. Wojan
- B. Types: As indicated on Drawings.
- C. Aluminum Extrusions:
 1. All frame and sash sections shall be extruded aluminum shapes produced from commercial quality 6063-T5 or 6063-T6 alloy and shall be free from defects impairing strength and/or durability.
 2. The frame depth shall be a nominal 3 3/4".
 3. All frame and sash member shall have a minimum nominal wall thickness of .125.
 4. No extruded plastics shall be allowed in the frame or sash members.
- D. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins 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.
- E. Glazing System:
 1. Comply with Section 088000 "Glazing".
 2. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
 3. Glazing Sealants: As recommended by manufacturer.
 - a. Sealant shall have a VOC content of 250 g/L or less.
- F. Hardware, General: Provide manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.
 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- G. Casement or Projected Window Hardware:
 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
 2. Hinges: Non-friction type, not less than two per sash.
 3. Lock: Manufacturer's standard.
 4. Comply with building code requirements for all hardware rescue windows.

- H. Weather Stripping:
 - 1. Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
 - 2. All sashes shall be double weatherstripped using dual durometer neoprene compression weatherstripping as per AAMA 701.2.
 - 3. All weatherstripping shall be held in extruded ports and secured to prevent loss or distortion when operating sash
- I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.3 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- B. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.4 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: The frame sill shall contain integral baffled weep holes that allow gravity water drainage and resistance to wind driven water and/or air.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- G. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.
- H. Each operating vent shall open 50 degrees for ventilation and cleaning. Also, each vent will have one or more handle locks [depending on window dimension] to provide a secure weathertight "locked" position.

2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
- E. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
- G. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

- 1.1 Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.
- 1.2 Work Included:
 - A. Furnish all items of Finish Hardware specified, scheduled, shown or required herein except those items specifically excluded from this section of the specification.
 - B. Related work:
 1. Division 00 00 00 - Procurement and Contracting Requirements
 2. Division 01 00 00 - General Requirements
 3. Division 06 00 00 - Wood, Plastics, and Composites
 4. Division 08 00 00 - Openings
 5. Division 10 00 00 - Specialties
 6. Division 11 00 00 - Equipment
 7. Division 26 00 00 - Electrical
 8. Division 27 00 00 - Communications
 9. Division 28 00 00 - Electronic Safety and Security
 - C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:
 1. Cabinet Hardware.
 2. Signs, except as noted.
 3. Folding partitions, except cylinders where detailed.
 4. Sliding aluminum doors
 5. Chain link and wire mesh doors and gates
 6. Access doors and panels
 7. Overhead and Coiling doors
- 1.3 Quality Assurance
 - A. Requirements of Regulatory Agencies:
 1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
 2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the

governmental authority having jurisdiction and to comply with Americans with Disabilities Act.

3. Provide hardware for fire-rated openings in compliance with NFPA 80 and state and local building code requirements. Provide only hardware that has been tested and listed by UL for types and sizes of doors required and complies with requirements of door and door frame labels.

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builders' hardware. He must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. The distributor must be a factory-authorized dealer for all materials required. The supplier shall be or have in employment an Architectural Hardware Consultant (AHC).

C. Electrified Door Hardware Supplier:

1. Shall be an experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
2. Shall prepare data for electrified door hardware, including shop drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this project.
3. Shall have experience in providing consulting services for electrified door hardware installations.

D. Pre-installation Meeting:

1. Before hardware installation, General Contractor/Construction Manager will request a hardware installation meeting be conducted on the installation of hardware; specifically that of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products, in conjunction with the hardware supplier for the project, shall conduct the meeting. Meeting to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Meeting to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.
2. When any electrical or pneumatic hardware is specified this meeting shall also include the following trades/installers: Electrical, Security, Alarm systems and Architect.
3. Convene one week or more prior to commencing work of this Section.
4. The Hardware Supplier shall include the cost of this meeting in his proposal.

E. Manufacturer:

1. Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

2. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

1.4 Submittals:

A. Hardware Schedule

1. Submit number of Hardware Schedules as directed in Division 1.
2. Follow guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule unless noted otherwise.
3. Schedule will include the following:
 - a. Door Index including opening numbers and the assigned Finish Hardware set.
 - b. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

- c. Hardware Locations: Refer to Article 3.1 B.2 Locations.
- d. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
- e. Hardware Description: Quantity, category, product number, fasteners, and finish.
- f. Headings that refer to the specified Hardware Set Numbers.
- g. Scheduling Sequence shown in Hardware Sets.
- h. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
- i. Electrified Hardware system operation description.
- j. "Vertical" scheduling format only. "Horizontal" schedules will be returned "Not Approved."
- k. Typed Copy.
- l. Double-Spacing.
- m. 8-1/2 x 11 inch sheets
- n. U.S. Standard Finish symbols or BHMA Finish symbols.

B. Product Data:

1. Submit, in booklet form Manufacturers Catalog cut sheets of scheduled hardware.
2. Submit product data with hardware schedule.

C. Samples:

1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule.

2. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Key Schedule:

1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.
2. Submit as a separate schedule.

E. Electrified Hardware Drawings:

1. Submit elevation drawings showing relationship of all electrical hardware components to door and frame. Indicate number and gage of wires required.
 - a. Include wiring drawing showing point to point wire hook up for all components.
 - b. Include system operations descriptions for each type of opening; describe each possible condition.

- F. Submit to General Contractor/Construction Manager, the factory order acknowledgement numbers for the various hardware items to be used on the project. The factory order acknowledgement numbers shall help to facilitate and expedite any service that may be required on a particular hardware item. General Contractor/Construction Manager shall keep these order acknowledgement numbers on file in the construction trailer.

1.5 Product Delivery, Storage, and Handling:

- A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the contractor.

1.6 Existing Conditions:

- A. Where existing doors, frames and/or hardware are to remain, conditions, preparations and functions shall be field verified to confirm compatibility with specified hardware. Where any incompatibility is discovered, notify the contractor or construction manager immediately and provide a suggested solution based on industry standard business practices.

1.7 Warranties:

- A. Refer to Division 1 for warranty requirements.
- B. Special Warranty Periods:

1. Closers shall carry manufacturer's 30-year warranty against manufacturing defects and workmanship.
 2. Locksets shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 3. Exit Devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.
 4. Continuous gear hinges shall carry manufacturer's lifetime warranty to be free from defects in material and workmanship.
 5. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.
- C. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work.

PART 2 - PRODUCT

- 2.1 Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.
- 2.2 Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, it is understood that this is the owner's Building Standard and "no substitution" is allowed.
- A. Hinges:
1. Furnish hinges of class and size as listed in sets.
 2. Numbers used are Ives (IVE).
 3. Products of a BHMA member are acceptable.
- B. Locksets and Latchsets - Cylindrical Type:
1. Function numbers listed are Best.
 2. Provide 2-3/4 inch backset.
 3. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond doorframe trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors.
 4. Locksets and Latchsets:
 - a. Best 93K
 5. Lockset Trim:
 - a. Best 15K
- C. Coordinator - Frame Stop Mounted:
1. Door coordinator shall prevent the active door from closing before inactive door. Stop mounted channel 1-5/8" x 5/8" steel tubing x length to suit door

- opening. Coordinator shall be UL listed. Furnish filler bars to fill gap between end of coordinator and inactive door frame. Furnish mounting brackets for all stop mounted hardware such as exit device strikes, door closer PA shoes, etc. Coordinators shall be prepared (cutout) at the factory for surface applied or concealed vertical rod panic devices if required.
2. Furnish with carry bar CB1 when required for proper operation.
 - a. Ives COR x length to suit.
 - b. Equal products of any BHMA manufacturer
- D. Electric Power Transfer:
1. Transfer power from door frame to edge of door, UL listed R4504.
 2. Von Duprin EPT
- E. Closers:
1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder. Cylinder body shall be 1 ½" in diameter, and double heat treated pinion shall be 11/16" in diameter with double D slab drive arm connection.
 2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
 4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
 5. All surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory.
 6. Closers will have Powder coating finish certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
 7. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, spacers and supports as required to correctly install door closers. State degree of door swing in the hardware schedule.
 8. LCN Series as listed in sets.
- F. Overhead Holders and Stops:
1. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.
 2. Manufacture products using base material of Brass/Bronze for US3, US4, & US10B finished products and 300 Stainless Steel for US32 & US32D finished products.
 3. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's selector chart.
 - a. Glynn-Johnson

G. Thresholds:

1. 1/2" high - 5" wide. Cope at jambs.
2. Furnish full wall opening width when frames are recessed.
3. Cope in front of mullions if thresholds project beyond door faces.
4. Furnish with non-ferrous Stainless Steel Screws and Lead Anchors.
 - a. National Guard as listed in sets
 - b. Equal of Zero or Reese

H. Door Sweeps:

1. Surface Sweeps:
 - a. National Guard as listed in sets
 - b. Equal by Zero or Reese

I. Miscellaneous:

1. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

J. Fasteners:

1. Furnish fasteners of the proper type, size, quantity and finish. Use machine screws and expansion shields for attaching hardware to concrete or masonry, and wall grip inserts at hollow wall construction. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames. Furnish full thread wood screws for attachment to solid wood doors and frames. "TEK" type screws are not acceptable.
2. Sex bolts will not be permitted on reinforced metal doors or wood doors where blocking is specified.

2.3 Finishes:

- A. Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in sets.

2.4 Templates and Hardware Location:

- A. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.
- B. Furnish metal template to frame/door supplier for continuous hinge.
- C. Refer to Article 3.1 B.2, Locations, and coordinate with templates.

2.5 Cylinders and Keying:

- A. All cylinders for this project will be supplied by one supplier regardless of door type and location.
- B. The Finish Hardware supplier will meet with Architect and/or Owner to finalize keying requirements and obtain keying instructions in writing.
 - 1. Supplier shall include the cost of this service in his proposal.
- C. Provide a cylinder and core for all hardware components capable of being locked.
- D. Provide cylinder cores master and grand master keyed to existing Bset key system according to Owner's instructions. Provide change keys, master keys and grand master keys as required by Owner.
- E. Provide cylinders with construction cores or keying for use during the construction period. When so directed, and in the presence of the Owner's security department or representative, convert construction cores or keying to the final system.
 - 1. Supplier shall include the cost of this service in his proposal.

PART 3 - EXECUTION

3.1 Installation

- A. General:
 - 1. Install hardware according to manufacturers installations and template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
 - 2. Provide blocking/reinforcement for all wall mounted Hardware.
 - 3. Reinforced hollow metal doors and frames and reinforced aluminum door and frames will be drilled and tapped for machine screws.
 - 4. Solid wood doors and frames: full thread wood screws. Drill pilot holes before inserting screws.
 - 5. Continuous gear hinges attached to hollow metal doors and frames and aluminum doors and frames: 12-24 x 1/2" #3 Phillips Keenform self-tapping. Use #13 or 3/16 drill for pilot.
 - 6. Continuous Gear Hinges require continuous mortar guards of foam or cardboard 1/2" thick x frame height, applied with construction adhesive.
 - 7. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.
- B. Locations:
 - 1. Dimensions are from finish floor to center line of items.
 - 2. Include this list in Hardware Schedule.

CATEGORY

DIMENSION

Hinges	Door Manufacturer's Standard
Flush Bolt Levers	72" and 12"
Levers	Door Manufacturer's Standard
Exit Device Touchbar	Per Template
Offset Pulls	Suitable for Exit Devices
Push Plates	52"
Pull Plates	42"
Wall Stops/Holders	At Head

C. Field Quality Inspection:

1. Inspect material furnished, its installation and adjustment, and instruct the Owner's personnel in adjustment, care and maintenance of hardware.
2. Locksets and exit devices shall be inspected after installation and after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
3. Closers shall be inspected and adjusted after the HVAC system is in operation and balanced, to insure correct installation and proper operation.
4. A written report stating compliance, and also locations and kinds of noncompliance shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

D. Technical and Warranty Information:

1. At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor/Construction Manager shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor/Construction Manager during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.
2. Submit to General Contractor/Construction Manager, two copies each of parts and service manuals and two each of any special installation or adjustment tools. Include for locksets, exit devices, door closers and any electrical products.

3.2 Hardware Sets:

Legend:

-  Link to catalog cut sheet
✂ Electrified Opening

Hardware Group No. 01 - RIM X MULLION

For use on Door #(s):
K100.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
1	EA	REMOVABLE MULLION	KR4954 STAB		689	VON
1	EA	PANIC HARDWARE	CDSI-98-EO		626	VON
1	EA	PANIC HARDWARE	CDSI-98-NL-OP-110MD		626	VON
3	EA	SFIC MORTISE CYL.	80-101		626	SCH
1	EA	SFIC RIM HOUSING	80-129		626	SCH
2	EA	90 DEG OFFSET PULL	8190HD 12" O		630	IVE
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4021		689	LCN
2	EA	FLUSH CEILING MTG PLATE	4020-18G SRT		689	LCN
1	SET	WEATHER SEAL	(BY FRAME MFR)			
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	655A-V3-223		A	ZER

Hardware Group No. 02 - PUSH/PULL

For use on Door #(s):
K100.2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
2	EA	PUSH/PULL BAR	9190EZHD-12"-NO		630-316	IVE
2	EA	OH STOP	100S		630	GLY
2	EA	SURFACE CLOSER	4021		689	LCN
2	EA	FLUSH CEILING MTG PLATE	4020-18G SRT		689	LCN

Hardware Group No. 03 - PRIVACY

For use on Door #(s):

K104.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	PRIVACY SET	9K30L 15D		626	BES
1	EA	OH STOP	90S		652	GLY
1	EA	SURFACE CLOSER	4011 MC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. 04 - CLASSROOM

For use on Door #(s):

K105.1 K107.1 K108.1 K110.1 K111.1 K112.1
K112A.1 K112A.2 K116.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D S3		626	BES
1	EA	SURFACE CLOSER	4111 HCUSH MC ST-2468 ST-3220		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE

Hardware Group No. 05 - CLASSROOM

For use on Door #(s):

K107A.1 K110A.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D S3		626	BES
1	EA	SURFACE CLOSER	4011 MC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS447		626	IVE

Hardware Group No. 06 - STOREROOM

For use on Door #(s):

K106.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CONST LATCHING BOLT	FB51T		630	IVE
1	EA	STOREROOM LOCK	9K37D 15D S3		626	BES
1	EA	COORDINATOR	COR X FL		US28	IVE
2	EA	SURFACE CLOSER	4111 HEDA MC		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
2	EA	WALL STOP	WS447		626	IVE

Hardware Group No. 07 - CLASSROOM

For use on Door #(s):

K111A.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D S3		626	BES
1	EA	OH STOP	90S		652	GLY
1	EA	SURFACE CLOSER	4011 MC		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE

Hardware Group No. 08 - RIM

For use on Door #(s):

K113.1 K115.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D S3		626	BES
1	EA	PANIC HARDWARE	LD-98-L-2SI-06		626	VON
2	EA	SFIC RIM HOUSING	80-129		626	SCH
1	EA	SURFACE CLOSER	4111 HCUSH MC ST-2468 ST-3220		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

Hardware Group No. 09 - STOREROOM

For use on Door #(s):

K114.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D S3		626	BES
1	EA	SURFACE CLOSER	4111 HCUSH MC ST-2468 ST-3220		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites and storefront framing.
2. Glazing sealants and accessories.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

- C. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

- E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

1.5 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.7 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to 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.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Guardian Glass; SunGuard.
 - 2. Vitro.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Design Snow Loads: As indicated on Drawings.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. 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. 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).
 - 2. 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.
 - 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Silicone-Coated Spandrel Glass: ASTM C 1048, Type I, Condition C, Quality-Q3.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seals.
 - 2. Perimeter Spacer: Manufacturer's standard warm-edge spacer material and construction.

2.7 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they 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' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Sealant shall have a VOC content of 250 g/L or less.
 - 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 25, Use NT.
- 1. Available Products:
 - a. GE Silicones; Silglaze II SCS2800
 - b. Tremco; Tremsil 600
 - c. Dow Corning Corporation; 795
 - C. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
- 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
- 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- 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.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 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.

3.4 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.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.6 INSULATING GLASS SCHEDULE

- A. Glass Type GL-1: Low-E-coated, clear insulating glass at all exterior locations unless indicated otherwise.
 - 1. Basis-of-Design Product, provide one of the following:
 - a. Guardian Glass; SunGuard SNX 62/27
 - b. Vitro (PPG); Solarban 70 XL
 - 2. Overall Unit Thickness: 1 inch (25 mm).
 - 3. Minimum Thickness of Each Glass Lite: 6 mm.
 - 4. Outdoor Lite: Heat-strengthened float glass.
 - 5. Interspace Content: Argon.
 - 6. Indoor Lite: Heat-strengthened float glass.
 - 7. Low-E Coating: Sputtered on third surface.
 - 8. Winter Nighttime U-Factor: .24 maximum.
 - 9. Summer Daytime U-Factor: .21 maximum.
 - 10. Visible Light Transmittance: 61 percent minimum.
 - 11. Solar Heat Gain Coefficient: .27 maximum.
 - 12. Safety glazing required.

END OF SECTION 088000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.
 - 2. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Delegated-Design Submittal: For seismic restraints for ceiling systems.
 - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research reports.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 ATTIC STOCK

- A. Provide 3% attic stock for SAT-1 and SAT-2, including accompanying metal suspension system.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 450 or less.

2.2 ACOUSTICAL PANELS

- A. Basis-of-Design Product: USG Radar Clima Plus- 2210
- B. : Manufacturer's standard panels according to ASTM E 1264.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- D. SAT-1
 - 1. Basis of Design: USG Radar Clima Plus- 2210
 - 2. Color: White
 - 3. Light Reflectance (LR): .84
 - 4. Ceiling Attenuation Class (CAC): 33
 - 5. Noise Reduction Coefficient (NRC): .55
 - 6. Edge/Joint Detail: Square Lay-in.
 - 7. Thickness: 5/8"
 - 8. Modular Size: 24 by 24 inches

2.3 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG- A-DX/DXL
- B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M.

2.4 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.5 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc; 7/8 inch Hemmed Angle molding, or a comparable product by one of the following:
 - 1. USG Corporation.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated.
- B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION

- A. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
 - 3. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.

END OF SECTION 095113

SECTION 096566 - RESILIENT ATHLETIC FLOORING

1.1 SUMMARY

- A. Section Includes:
 - 1. Rubber sheet flooring.

1.2 COORDINATION

- A. Coordinate layout and installation of flooring with floor inserts for equipment.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details and locations of the following:
 - 1. Layout, colors, widths, and dimensions of game lines and markers.
 - 2. Seam locations for sheet flooring.
- C. Samples: For each exposed product and for each type, color, and pattern specified.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Sheet Vinyl Flooring Installer Qualifications: An experienced installer who has completed sheet vinyl flooring installations using seaming methods indicated for this Project and similar in material, design, and extent to that indicated for this Project; who is acceptable to manufacturer; and whose work has resulted in installations with a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 RUBBER SHEET FLOORING -refer to sheet A2.01

- A. Description: Rubber athletic flooring provided as rolled goods for adhered installation.

B. Material:

RSF-1 - MONDO - Weight and Skate Resistant flooring Installed at - Permanent Installation at Locker Rooms

RSF-2 - TUFF ROLL - Rubber Flooring - Rolled Good, Loose laid to be removed during offseason

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare according to ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended in writing by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Sweep and vacuum clean substrates to be covered by flooring immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FLOORING INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions.
- B. Scribe, cut, and fit flooring to butt neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
- C. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating subfloor markings on flooring. Use nonpermanent, nonstaining marking device.

3.3 SHEET FLOORING INSTALLATION

- A. Unroll sheet flooring and allow it to stabilize before cutting and fitting.
- B. Lay out sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Locate seams according to approved Shop Drawings.
- C. Adhere products to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
- D.
 - 1. Chemically Bonded Seams: Comply with ASTM F693. Seal seams to prevent openings from forming between cut edges and to prevent penetration of dirt, liquids, and other substances into seams.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from flooring surfaces.
 - 2. Sweep and vacuum flooring thoroughly.
 - 3. Damp-mop flooring to remove marks and soil after time period recommended in writing by manufacturer.
- B. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Do not move heavy and sharp objects directly over flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096566

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Steel and iron.
 - 2. Galvanized metal.
 - 3. Acrylic Plaster.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.

2. Acrylic Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron, Galvanized-Metal and Aluminum Substrates:

1. Water-Based Light Industrial Coating System:

a. Prime Coat: Primer, water based.

1) Benjamin Moore: Super Spec HP Acrylic Metal Primer P04.

2) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series

- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5).
 - 1) Benjamin Moore: Corotech Acrylic DTM Enamel Gloss V331
 - 2) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series

B. Acrylic Plaster Substrates:

1. Latex System:

- a. Prime Coat: Primer, bonding, water based.
 - 1) Benjamin Moore: Fresh Start High-Hiding All Purpose Primer 0046.
 - 2) S-W PrepRite ProBlock Latex Primer/Sealer
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).
 - 1) Benjamin Moore: Ultra Spec EXT Satin Finish N448.
 - 2) S-W A-100 Exterior Latex Satin, A82 Series

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete masonry units (CMUs).
 - 2. Steel and iron.
 - 3. Galvanized metal.
 - 4. Wood.
 - 5. Gypsum board.
 - 6. Acoustical ceiling panels.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
 - 1. Product Data: For paints and coatings, indicating VOC content.

2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
- C. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Dry-Fog Coatings: 400 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 7. Pretreatment Wash Primers: 420 g/L.
 8. Shellacs, Clear: 730 g/L.
 9. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors to match Sherwin Williams:
1. P-1: SW 7632 Modern Gray
 2. P-2: SW 7005 Pure White
 3. P-3: SW 7074 Software
 4. P-4: SW 6732 Organic Green
 5. P-5: SW 6838 Vigorous Violet
 6. P-6: SW 6718 Overt Green
 7. P-7: SW 6565 Grandeur Plum
 8. P-8: SW 6761 Thermal Spring

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Masonry (Clay and CMUs): 12 percent.
 2. Wood: 15 percent.
 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

- 1. Latex System MPI INT 4.2A:
 - a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
 - 1) Benjamin Moore: Super Spec Masonry Interior/Exterior Hi-Build Block Filler 0206.
 - 2) S-W PrepRite Block Filler, B25W25.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.
 - 1) Benjamin Moore: Ultra Spec 500 Zero VOC Interior Gloss Finish N540.
 - 2) S-W ProMar 200 Latex Gloss, B11-2200 Series.

B. Steel Substrates:

- 1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
 - a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
 - 1) Benjamin Moore: Super Spec HP D.T.M. Acrylic Low Lustre P25.
 - 2) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
 - b. Topcoats: Latex, interior, institutional low odor/VOC (MPI Gloss Level 5), MPI #147.

- 1) Benjamin Moore: Ultra Spec 500 Zero VOC Interior Low Sheen Finish N537.
 - 2) S-W Pro Industrial Acrylic Gloss Coating, B66-660 Series.
 2. Water-Based Dry-Fall System:
 - a. Ensure all bare surfaces are appropriately primed per paint manufacturers recommendations.
 - b. Top Coat: Dry-fall latex, flat, MPI #118:
 - 1) Benjamin Moore: CoronadoSuper Kote 5000 Latex Flat Dry Fall N110, at 5.0 mils wet, 2.0 mils dry.
 - 2) S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series, at 6.0 mils wet, 1.7 mils dry.
- C. Wood Substrates: Wood trim.
 1. Latex over Alkyd Primer System MPI INT 6.3U:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - 1) Benjamin Moore:Super Spec Alkyd Enamel Undercoater & Primer Sealer C245
 - 2) S-W PrepRite ProBlock Primer Sealer, B51-620 Series
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.
 - 1) Benjamin Moore: Ultra Spec 500 Zero VOC Interior Eggshell Finish N538.
 - 2) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- D. Gypsum Board Substrates:
 1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Prime Coat: Primer sealer, latex, interior , MPI #50.
 - 1) Benjamin Moore: Ultra Spec 500 Zero VOC Interior Latex Primer N534
 - 2) S-W ProMar 200 Zero VOC Latex Primer, B28W2600
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, eggshell (MPI Gloss Level 3), MPI #52.
 - 1) Benjamin Moore: Ultra Spec 500 Zero VOC Interior Eggshell Finish N538
 - 2) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series
- E. Acoustical Ceiling Panels:
 1. Water-Based Dry-Fall System:
 - a. Top Coat: Dry-fall latex, flat, MPI #118:

- 1) Benjamin Moore: CoronadoSuper Kote 5000 Latex Flat Dry Fall N110, at 5.0 mils wet, 2.0 mils dry.
- 2) S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-80 Series, at 6.0 mils wet, 1.7 mils dry.

F. Steel Railings:

1. High Performance Polyurethane Coating:
 - a. Prime Coat: Institutional low odor/VOC
 - 1) S-W Macropoxy 646 Fast Cure Epoxy.
 - b. Intermediate Coat: Polyurethane, matching topcoat.
 - c. Topcoats: Polyurethane, Institutional low odor/VOC (MPI Gloss Level 6).
 - 1) S-W Hi-Solids Polyurethane.

END OF SECTION 099123

SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fabricated backlit aluminum acrylic faced characters

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For 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 other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- D. Samples: For each exposed product and for each color and texture specified.
- E. Delegated-Design Submittal: For signs indicated in "Performance Requirements" Article.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of dimensional character sign type(s) indicated on drawings according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
- C. Thermal Movements: For exterior fabricated channel dimensional characters and shapes, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- 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.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles to match owner provided and approved logo and fonts, and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.R.K. Ramos.
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - d. Architect approved equal.
 - 2. Illuminated Characters: Backlighting character construction with LED lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
 - a. Power: As indicated on electrical Drawings.
 - 3. Character Material: Cast aluminum.
 - 4. Character Height: As indicated on Drawings.

5. Finishes:
 - a. Integral Aluminum Finish: Clear anodized.
 6. Mounting: Concealed studs.
- B. Fabricated Aluminum with Acrylic Face Lit Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.R.K. Ramos.
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - d. Architect approved equal.
 2. Illuminated Characters: face lit character construction with integral LED lighting, including transformers, insulators, and other accessories for operability, with provision for servicing and concealing connections to building electrical system. Use tight or sealed joint construction to prevent unintentional light leakage. Space lamps apart from each other and away from character surfaces as needed to illuminate evenly.
 - a. Power: As indicated on electrical Drawings.
 3. Character Material: Aluminum/Acrylic
 4. Character Height & Depth: As indicated on Drawings.
 5. Finishes:
 - a. Integral Aluminum Finish: Clear anodized.
 - b. Acrylic Face color: White
 6. Mounting: Concealed studs.

2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
 3. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs 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.
 - b. 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.
- B. Adhesive: As recommended by sign manufacturer.
1. Adhesives shall have a VOC content of 70 g/L or less.

- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.4 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 2. 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.
 - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 - 5. Provide rabbets, lugs, and tabs 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.
 - 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
 - 1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match sign-background color unless otherwise indicated.
 - 2. Stainless-Steel Brackets: Factory finish brackets with No. 4 finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 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. Concealed 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 sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 2. 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. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
 5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. HDPE toilet compartments configured as toilet enclosures and urinal screens.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for each exposed product and for each color and texture specified.
- D. Product certificates.
- E. Maintenance data.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1.Flame-Spread Index: 75 or less.
 2. Smoke-Developed Index: 450 or less.

PART 2 - PRODUCTS

2.1 PHENOLIC-CORE UNITS

- 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:
- B. Basis of Design: General Partition Mfg. Corp./ Color White Twill
- C. Available Manufacturers subject to compliance with requirements, provide product by one of the following:
 1. Accurate Partitions Corporation.

2. American Sanitary Partition Corporation.
 3. Ampco, Inc.
 4. Bobrick Washroom Equipment, Inc.
 5. Bradley Corporation; Mills Partitions.
 6. Capitol Partitions, Inc.
 7. Flush Metal Partition Corp.
 8. General Partitions Mfg. Corp.
 9. Global Steel Products Corp.
 10. Sanymetal; a Crane Plumbing company.
 11. Weis-Robart Partitions, Inc.
- D. Toilet-Enclosure Style: Floor anchored.
- E. Urinal-Screen Style: Wall hung flat panel.
- F. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.
- G. Pilaster Shoes and Sleeves (Caps): Fabricated from stainless-steel sheet, not less than 3 inches (76 mm) high, finished to match hardware.
- H. Urinal-Screen Construction:
- 1.Flat-Panel Urinal Screen: Matching panel construction.
- I. Brackets (Fittings):
- 1.Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.
- J. Phenolic-Panel Finish: Facing sheet of one color and pattern in each room.
- 1.Color and Pattern: Custom Laminate: Formica White Twill Matte Finish 9285-58. Linear patter to be vertical.

2.2 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
- 1.Material: Stainless steel.
 2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.

6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. Urinal Screens: Urinal screens shall be 48 inches high mounted 14 inches above finish floor and of same construction and finish as partition system panels.
- B. Panels: Dividing panels shall be 55-inches high, unless noted otherwise and mounted 14-inches above finish floor.
- C. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- D. Doors: 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 indicated to be accessible to people with disabilities.
 - 1.General: Doors shall be 55-inches high, unless noted otherwise and mounted 14-inches above finish floor.
 2. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
 3. Latch and Keeper: Manufacturer's standard recessed latch unit designed for emergency access and with combination rubber-faced door strike and keeper.
 - a. Manufacturer's standard surface mounted latch unit designed for handicapped accessibility and with combination rubber-faced door strike and keeper.
 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance screen doors.
 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

- a. Pilasters and Panels: 1/2 inch (13 mm).
- b. Panels and Walls: 1 inch (25 mm).

2. Continuous Brackets: Secure panels in position with manufacturer's recommended anchoring devices.

- a. Locate continuous wall brackets so holes for wall anchors occur in masonry or tile joints.
- b. Secure panels to pilasters with continuous brackets located to align with brackets at wall.

- B. Urinal Screens: Secure panels to wall with wing bracket, plumb and tighten installation with devices furnished. Set units to provide support and to resist lateral impact.

3.2 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.

END OF SECTION 10155

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Childcare accessories.
3. Custodial accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full size, for each exposed product and for each finish specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Warranty Period: 15 years from date of Substantial Completion.
- B. Special Automatic Soap Dispenser Warranty: Manufacturer's standard form in which manufacturer agrees to replace soap dispensers that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Lifetime.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser:
 - 1. Basis-of-Design Product: ASI Twin Hide A Roll
- B. Wood Benches
 - 1. Basis of Design Penco Hardwood Top -
 - 2. Heavy Duty Bench Pedestals
 - 3. Accessible Units shown on plan
- C. Waste Receptacle:
 - 1. Basis-of-Design Product: ASI - simplicity recessed waste receptacle
- D. Automatic Liquid-Soap Dispenser:
 - 1. Furnished By Owner, Installed by Contractor
- E. Grab Bar:
 - 1. Basis For Design Product - ASI Security Grab Bars.- 18" 36" and 42"
- F. Sanitary-Napkin Disposal Unit:
 - 1. Basis-of-Design Product: ASI Sanitary Napkin Disposal Unit With Lock - Model 0473-1A
- G. Hand Dryer
 - 1. Basis of Design Product- ASI - SAFE DRI - High Speed Hand Dryer - Model # 0198 -
- H. Diaper-Changing Station:
 - 1. Basis-of-Design Product: Baby Changing Station, HORIZONTAL - STAINLESS STEEL, Recessed - 9018

Recessed In Block

2.3 LOCKER ROOM ACCESSORIES

- A. Coat Hook
 - 1. Basis of Design ASI 7345-S Commercial Restroom Double Robe Hook, Stainless Steel w/ Satin Finish

- B. Wood Benches
 - 1. Basis of Design Penco Hardwood Top -
 - 2. Heavy Duty Bench Pedestals
 - 3. Accessible and Standard Units shown on plan

2.4. UTILITY ROOM ACCESSORIES

- C. Mop and Broom Holder:
 - 1. Basis-of-Design Product: ASI 1315-4 Shelves, Utility Hook & Mop Strip w/ Drying Rod (3 Hooks, 4 Holders) 36"

2.4 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Fire-End & Croker Corporation.
 - c. GMR International Equipment Corporation.
 - d. Guardian Fire Equipment, Inc.
 - e. JL Industries, Inc.; a division of the Activar Construction Products Group.

- f. Larsens Manufacturing Company.
- g. Modern Metal Products, Division of Technico Inc.
- h. MOON American.
- i. Nystrom, Inc.
- j. Potter Roemer LLC.
- k. Strike First Corporation of America (The).

B. Cabinet Construction: Nonrated.

- 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- (1.09-mm-) thick cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

- 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch (32- to 38-mm) backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Stainless Steel sheet.

G. Door Style: Vertical duo panel, frameless, with no exposed hinges.

H. Door Glazing: Tempered float glass (clear).

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:

- 1. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
- 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Engraved.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.

K. Materials:

- 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.

- b. Color: As selected by Architect from full range of industry colors and color densities.
- 2. Stainless Steel: ASTM A 666, Type 304.
 - a. Finish: No. 4 directional satin finish.
- 3. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Babcock-Davis.
 - d. Badger Fire Protection.
 - e. Buckeye Fire Equipment Company.
 - f. Fire End & Croker Corporation.
 - g. Guardian Fire Equipment, Inc.
 - h. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - i. Kidde Residential and Commercial Division.
 - j. Larsens Manufacturing Company.
 - k. MOON American.
 - l. Nystrom, Inc.
 - m. Oval Fire Products Corporation.
 - n. Potter Roemer LLC.
 - o. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - p. Strike First Corporation of America (The).
 - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical UL-rated Type 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International.
 - c. Babcock-Davis.
 - d. Badger Fire Protection.
 - e. Buckeye Fire Equipment Company.
 - f. Fire End & Croker Corporation.
 - g. Guardian Fire Equipment, Inc.
 - h. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - i. Kidde Residential and Commercial Division.
 - j. Larsens Manufacturing Company.

- k. Nystrom, Inc.
 - l. Potter Roemer LLC.
 - m. Pyro-Chem; Tyco Fire Suppression & Building Products.
 - n. Strike First Corporation of America (The).
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 109999 - MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following:
 - 1. AED Defibrillator box.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For products or systems required.
 - 1. Include dimensioned elevations.
 - 2. Include sections of typical trim members.
 - 3. Show anchors, grounds, reinforcement, accessories, layout and installation details.
- C. Samples: Manufacturer's color charts showing the full range of colors.
- D. Operation and maintenance data.
- E. Warranty: Each product shall supply Manufacturer's standard warranty form in which manufacturer agrees to repair or replace products from material and workmanship defects within 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 AED DEFIBRILLATOR BOX

- A. Product: The Phillips HeartStart FRx AED, Features CPR Coaching including counting out the 30 compressions and two breaths. The HeartStart FRX meets current AHA guidelines and comes with the highest water and dust rating available. Two sets of adult pads, an Accessory Kit (razor, scissors, face shield, gloves) and carry case is included. The unit has a 5 year manufacturer's warranty. An optional Pediatric Key converts the adult pads for use on a child.
 - 1. HeatStart FRx Aed Unit
 - 2. Premium Semi-recessed Cabinet
 - a. Product: PFE7023D.
 - 3. Pediatric Key.
 - 4. HeartStation Wall Cabinet with Strobe & Alarm System.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in location and at mounting heights indicated and according to manufacturer's written instruction.

END OF SECTION 109999

ICE RINK REFRIGERATION AND PIPING

GENERAL

SCOPE OF WORK

- A. This Section of the Contract includes all Ice Rink Equipment work called for or implied by the drawings and specification, together with all necessary incidentals whether referred to or not, as will be required to complete the work to the full intent and meaning of the drawings and specifications. The specification and drawings describe the complete and operational ice plant to be constructed. The work includes but is not limited to the following:
 1. Trane
 - a. Model: CGAM 080F2 2EXJ2AIA3DIAX AID2B4XXAXXX BIA3AIDIXXCSS:
 - b. Capacity 48.72 refrigeration tons
 - c. Evaporator Leaving – Entering Temperature 10F – 15F
 - d. Evaporator Flow Gallons Per Minute 285
 - e. 460 Volts/3 Phase/ 60 Hz
 - f. Electrical MCA-MOCP Amperage 161.8-200.
 - g. R454B refrigerant.
 2. Cold Glycol system consisting of 40% Dow Therm SRI Ethylene Glycol.
 3. Tri-Con pre-insulated pipe or equal.
 - a. Service Pipe: IPS DR-17 HDPE, supplied in 20 Ft. lengths.
 - b. Insulation: Factory injected polyurethane foam.
 - a. Jacket: Extruded, Black, Seamless HDPE, Resin Type III, Grade P34 to ASTM D-3350.
 - b. Foam Thickness: 2.54"
 4. 2 Cold Floor Pumps:
 - a. Model: Armstrong 4280-3x2.5x6-2P 15 HP T.E.F.C.
 5. 1 Snow Melt Pump
 - a. Model: Armstrong 4380-0103-000.3
 - b. HP: 0.33 HP
 6. 1 Snow Melt Heater:
 - a. Model: Hamilton Engineering HW399
 - b. HP: 399,999 BTU/hr
 7. 1 80 Gallon Expansion Tanks:
 - a. Model: Armstrong AX-144V
 8. 1 60 Gallon Expansion Tank:
 - a. Model: Armstrong AX-40V
 9. Cold floor return header: 6" HDPE SDR 11
 10. Cold floor reverse return: 6" HDPE SDR 11
 11. Cold floor supply header: 6" HDPE SDR 11
 12. Concrete: 5" Thick

13. Wire Mesh:
 - a. 6" x 6" x w2.1 x w2.1 to 2" from edge of slab. 6" Minimum overlap between sheets. Tie to rebar every 24" Terminate 2" from rink edge.
14. Rink Tubing:
 - a. 1" polyethylene pipe @ 3 1/2" O.C. fusion welding connections
15. Reinforcement:
 - a. #4 Bars, 14" on center parallel with rink piping and 12" on center perpendicular to rink piping. Minimum lap 25"
16. Pipe and rebar support chairs:
 - a. 2'-0" O.C. for length of rink. Overlap minimum of 2 rink pipes.
17. Insulation and Vapor Barrier:
 - a. Two layers of 1-1/2" thick Dupont, 4' x 8' sheets, 25 PSI stagger joints, finished thickness 3" cover insulation with 6 mil vapor barrier top and bottom.
18. Expansion Joint: Sikasil 728 SL
19. Equipment housekeeping pads by others
20. Insulation of cold floor piping and refrigerant piping. Above and below ground.
21. Cutting, patching, and sleeving by Contractor for all refrigerant, water and glycol piping.
22. Power and control wiring for glycol pumps.
23. Start-up and testing.
24. Training of owner and staff.
25. Instruction and operating manuals and as-built drawings (6 copies).

QUALIFICATION FOR REFRIGERATION INSTALLER

- A. Refrigeration Installer shall have installed a minimum of 5 artificial ice rinks within previous 5 years to be eligible to submit a bid on this work. Submittal shall be on company letterhead, signed by an authorized representative of the company and include project description, portion of project completed by the company, location, construction cost, completion date, owner's name, owner's representative, phone number and completion date of work.
 - B. The Refrigeration Installer shall have adequate personnel and equipment, and shall be approved by the Engineer.
 - C. The Refrigeration Installer shall be able to satisfactorily service the equipment after installation, and shall provide 24 hour service for 1 year after acceptance of system by Owner.
 - D. The Refrigeration Installer shall provide all product data, shop drawings, designs, daily logs, record documents and warranties. The Refrigeration Installer shall furnish, install and design a complete system including all engineering, shop drawings, submittals and design work, calculations, etc. The Refrigeration Installer shall perform all work to obtain approval and
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permits of the ice floor system design and installed work from the local and State governing authorities and shall abide by all code requirements. The Refrigeration Installer shall include costs to pay for permits as necessary.

- E. Ice Builders, Cimco and Serv-Ice are approved to provide proposals for this project. Others to be approved by Architect and Engineer.
- F. As evidence and assurance of the contractor's concrete subcontractor's ability to construct the project the contractor placing and finishing the concrete must have successfully completed the placement and finishing of concrete on five (5) concrete ice rink floor construction projects within the past five (5) years. Submit information on each project. Submittal shall be on company letterhead, signed by an authorized representative of the company and include project description, portion of project completed by the company, location, construction cost, completion date, owner's name, owner's representative, phone number and completion date of work.

RELATED WORK GENERAL

- A. The Ice Rink Contractor shall coordinate all phases of the above Scope of Work with the General Contractor, Electrical, and Mechanical Contractors.

RELATED WORK

- A. Work by Other Subcontractor(s):
 - 1. 480 V, 3-phase, electric feeder from the Building Main Switchboard to the Chiller Package Disconnect.
 - 2. Two, 480V, 3-phase, electrical feeders from the Building Main Switchboard to the Cold Floor Pump Starters.
 - 3. Two, 480V, 3-phase, electrical feeders from the Cold Floor Pump Starters to the Chiller Package Mounted Pumps.
 - 4. One Control Conduit from the Chiller Package Control Panel to the Cold Floor Pump Starters.

SHOP DRAWINGS

- A. Provide 6 copies of shop drawings for the entire ice system and floor. Shop drawings shall include all equipment specifications, ice floor layout, piping layout, piping schematic flow diagrams, motor control centers, electrical power diagrams, control diagrams and wiring and details of construction. Complete shop drawings shall be provided. No part of ice system will be released for construction until entire submittal is accepted by Engineer.

Port Austin Four
Seasons Pavilion
Port Austin, Michigan

WARRANTY

- A. The contractor shall warranty all parts and labor of the ice rink system for a period after the acceptance of the Owner and when they have assumed operation of the facility. Warranty on equipment shall be in effect for the duration of the time offered by the manufacturer of the equipment. The chiller package shall have full 1-year warranty.
- B. The Refrigeration and Rink Piping Installer guarantees that he shall repair, replace, and install any or all parts, materials, or workmanship found to be defective or lacking in specified capacity as stipulated in foregoing specifications and/or shown on drawings. Guarantee includes necessary labor, as well as material and refrigerant required for repair, replacement, and/or 24 hour per day service for a year referred to above.
- C. Concrete Rink Floor shall be 1-year warranty

GENERAL

- A. Manufacturers and equipment specified below are for the purpose of setting a minimum standard of capacity and quality of equipment for the performance of the ice rink system.
 - 1. Refrigeration Capacity of the system is a total of 44.72 Tons. Glycol Leaving 10°F and Glycol Entering 15°F Refrigeration.
 - 2. 50 Degrees Ambient
 - 3. Number of Chillers: 1 Chiller
 - 4. Electrical Supply (Power): 480V/3Ph/60 HZ.
(Control) 120V/1Ph/60 HZ.
 - a. All equipment shall be mechanically braced for an available fault of no less than 65,000 amps.

END OF SECTION

ICE RINK FLOOR – CONCRETE SURFACE

GENERAL

SECTION INCLUDES

- A. Rink floor grading and materials.
- B. Insulation and vapor barrier.
- C. Concrete rink floor.
- D. Ice rink expansion joints.

SUBMITTALS

- A. Submit survey of subgrade elevations before installation of rink floor insulation.
- B. Submit survey of finished rink piping elevations.
- C. Shop drawings of the piping, tubing, headers, rink chair, reinforcement, insulation, and vapor barrier shall be submitted.
- D. Concrete mix design shall be submitted for approval a minimum of 6 weeks prior to the scheduled rink pour date.

PRODUCTS

ICE RINK PIPE MATERIAL

- A. Pipe material shall be high-density virgin polyethylene, PE3408 resin, and shall conform with ASTM D2513 (latest edition) (Thermoplastic Gas Pressure Pipe, Tubing, Fittings) or ASTM D3350 (latest edition) (Polyethylene Plastic Pipe and Fittings Materials).
- B. Minimum density of piping shall be 58 lbs/ft³ (0.955 gm/cc).
- C. Maximum working pressure rating shall be at minimum 160 psi.
- D. Minimum pipe dimensions in inches shall conform to the following:

Nominal O.D.	<u>3/4 Inch</u>	<u>1 Inch</u>	<u>3 Inch</u>	<u>6 Inch</u>	<u>8 Inch</u>
Actual O.D.	1.050	1.315	3.500	6.625	8.625
Wall thickness	0.095	0.117	0.318	0.602	0.784
Actual I.D.	0.851	1.066	2.838	5.372	6.994

E. All piping and tubing connections shall be by fusion welding. Welds shall be performed on the Site by personnel fully trained and experienced in the required procedures.

ICE RINK FITTING MATERIAL

A. Material shall be high-density virgin polyethylene using PE3408 resin and shall conform with ASTM D2513 (latest edition) (Thermoplastic Gas Pressure Pipe, Tubing, Fittings) or ASTM D3350 (latest edition) (Polyethylene Plastic Pipe and Fittings).

B. Butt Heat Fusion Fittings shall conform with ASTM D3261 (latest edition).

C. Socket-Type fittings shall conform with ASTM D2683 (latest edition).

D. Return bends shall be fabricated from high-density virgin polyethylene to 3.5" centers as shown on the Drawings.

E. All fittings shall be manufactured, not field or shop fabricated.

F. Minimum density of fitting material shall be 58 lbs/ft³ (0.955 gm/cc).

G. Service Saddles:

1. Shall conform to the above requirements.
2. Shall be socket-type fittings with a minimal restriction equal to the actual I.D. of the pipe. Square base.

FLOOR INSULATION

A. Floor Insulation Material: Two layers of 1.5-inch thick), Dupont HI-25.

B. Mastic: Dow Chemical Company General Purpose Mastic No. 11.

C. Vapor Barrier: 6 mils thick clear polyethylene sheeting. Provide in rolls of maximum width and length to minimize seams. Supply with compatible poly tape for taping holes and all seams.

TUBING/REINFORCEMENT SUPPORTS

A. Approved Manufacturers: Hunter Wire Products Ltd, or approved equal.

B. Style: Combination type functioning as tubing spacers as well as longitudinal rebar supports.

C. Wire Material: 0.1875-inch plain steel wire

D. Base Plate: Continuous, 3 inches width, 24-gauge cold rolled steel.

E. Length Per Support: 70" long

REINFORCING

A. Reinforcing Bars: Deformed billet steel bars conforming to ASTM A615 (latest edition), Grade 60.

B. Welded Wire Fabric: WWF 6 by 6-W1.4 by W1.4 conforming to ASTM A185 (latest edition).

C. Tie Wire: Black annealed wire, 16 gauge or heavier.

D. Reinforcement bars shall be supported over header trenches as shown on the Drawings.

EXPANSION JOINT MATERIAL

A. The sealing of the Cold Floor to Perimeter Slab pavement joints will be made with a one-component, low modulus, self-leveling, elastomeric silicone sealant.

B. Quality Assurance

- a. The manufacturer of the specified product shall be ISO 9001:2008 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.
- b. Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
- c. Install materials in accordance with all safety and weather conditions required by the manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

C. Storage

- a. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.
- b. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.
- c. Condition the specified product as recommended by the manufacturer.

D. Warranty

- a. Provide a written warranty from the manufacturer against defects of materials for a period of one (1) year, beginning with date of substantial completion of the project.

E. Manufacturer

- a. Sikasil 728 SL, as manufactured by Sika Corporation, 201 Polito Avenue, Lyndhurst, NJ 07071 is considered to conform to the requirements of this specification.

F. Materials

- a. Silicone sealant
 - i. The joint sealant shall be a one-component, self-leveling, silicone-based material. It shall be applicable in horizontal joints. The sealant shall principally cure under the influence of atmospheric moisture to form an elastomeric substance.
- b. Backer rod or bond breaker tape as approved by engineer.

G. Performance Criteria

- a. Properties of the uncured Silicone sealant:
 - i. Initial Cure (Tack-Free Time) ASTM C-679: 110 minutes
 - ii. Consistency: self-leveling
 - iii. Color: Limestone & Gray
- b. Properties of the cured silicone sealant:
 - i. Tensile Properties (ASTM D-412) at 21 days - Self-Leveling
 - ii. Tensile Strength at break: minimum 100 psi (0.69 Mpa)
 - iii. Tensile Elongation: minimum 1200%
 - iv. Modulus of Elasticity 100% Elongation 30 psi (0.21 Mpa) min
- c. Shore OO Hardness (ASTM D-661) at 21 days:
 - i. Self-leveling: 50+/-5
 - ii. Peel Strength (ASTM C-794) a. 25-pli 0% Adhesion Loss
 - iii. Service Range: -80o F (-62oC) to 350oF (176oF)
 - iv. Joint Movement (ASTM C-920): +100% / -50%
 - v. The sealant shall be non-staining.
 - vi. Final Cure: 7 to 10 days

H. Surface Preparation

- a. The joint and adjacent substrate must be clean, dry, sound and free of surface contaminants. Remove all traces of dust, laitance, grease, oils, curing compounds, form release agents and foreign particles by mechanical means, i.e. – sandblasting, etc., as approved by the Engineer. Blow joint free of dust using compressed air line equipped with an oil trap.

I. Application

- a. Install approved backer rod or bond breaker tape in all joints subject to thermal movement to prevent three-sided bonding and to set the depth of the sealant at a maximum of 1/2 in., measured at the center point of the joint width. Approval of the backer rod or bond breaker tape shall be made by the Engineer.
- b. Joints shall be masked to prevent discoloration or application on unwanted areas, as directed by the Engineer. If masking tape is used, it shall not be removed before tooling yet must be removed before the initial cure of the sealant. Do not apply the masking tape until just prior to the sealant application.
- c. Install sealant into prepared joints when the joint is at mid-point of its expansion and contraction cycle. Pour or extrude the sealant into the prepared joint in one direction and allow it to flow and level as necessary. Avoid overlapping the sealant to eliminate the entrapment of air. Tool as required to properly fill the joint.

- d. Sealant must be recessed in the joint a minimum of 1/4 inch from the surface.
- e. Adhere to all limitations and cautions for the polyurethane sealant in the manufacturer's printed literature.

J. Cleaning

- a. The uncured silicone sealant can be cleaned with an approved solvent. The cured silicone sealant can only be removed mechanically.
- b. Leave work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

ICE RINK CONCRETE MATERIALS

A. General: The concrete design mix shall be submitted for approval 6 weeks prior to scheduled pour

B. Cement: All cement shall be standard gray Type 1 Portland cement and shall conform to the "Standard Specification for Portland Cement" (ASTM C150, latest edition). All cement shall be of recent manufacturer. Once a manufacturer is selected, only that manufacturer's product shall be used. To obtain uniformity of color in the mix, all cement used shall be from a single batch.

C. Normal Weight Aggregates: ASTM C33 (latest edition), and as herein specified. Aggregates shall not contain lignite or ferrous material that will cause staining of the concrete surface. Aggregates shall be free of chert or other expansive materials that can cause pop-outs of the concrete surface

D. Fine Aggregate: Clean, sharp, natural sands free from loam, clay, lumps, or other deleterious substances.

E. Water: Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substance that may be deleterious to concrete or steel, and must not contain more chloride ions than are present in municipal drinking water, but not more than 0.1 percent.

F. Admixtures:

1. Responsibility: The Testing Laboratory employed shall be charged with full control of the use of the admixture under the direction of the manufacturer's representative. The design mix shall include the admixture and the quantity of concrete ingredients shall be based on the influence of the admixture. All admixtures shall conform to ASTM C494 (latest edition). Notify the admixture manufacturer not less than 14 days before pouring concrete on how the admixture is being used. When an admixture is approved for this Project, no change shall be made in the brand or quality of the admixture without the written approval of the Engineer and Contractor, and if a change is granted then a new design mix shall be determined by the laboratory.

2. Water Reducing Admixture: Eucon WR-75 by the Euclid Chemical Company, Pozzolite 200N by Master Builders, Plastocrete 161 by Sika Chemical Corporation, or approved equal. The admixture shall conform to ASTM C494 (latest edition), Type A, and not contain more chloride ions than are present in municipal drinking water, but not more than 0.1 percent.
3. High Range Water Reducing Admixture, HRWRA (Superplasticizer): Eucon 37 by Euclid Chemical Company or Sikament by Sika Chemical Corporation. The admixture shall conform to ASTM C494 (latest edition), Type F or G, and not contain more chloride ions than are present in municipal drinking water, but not more than 0.1 percent. The use of superplasticizer varies with every application; therefore, the Engineering Department of the supplier must be in attendance at the time of pouring to vary mixture as required. The HRWRA shall be added on Site.
4. Air Entraining Admixture: An air entraining admixture conforming to ASTM C260 (latest edition) shall be used in all concrete exposed to the weather. The air content of this concrete shall be between 2 percent and 4 percent. The admixture shall be:
 - a. "Air-Mix" manufactured by Euclid Chemical Company, "Darex AEA" manufactured by Dewey & Almy Chemical Corp., Cambridge, Mass., or "M.B.V.R." manufactured by Master Builders.

G. Proportioning and Design of Mixes:

1. Prepare design mix for the type and strength of concrete in accordance with applicable provisions of ASTM C94 (latest edition).
2. The proportions of aggregate to cement for any concrete shall be such as to produce a mixture which will readily work into the corners and angles of the forms and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate, honeycomb, or allow excess free water to collect on the surface.
3. All concrete for this Project shall be furnished by a ready-mixed concrete plant approved by the Engineer before delivery of any concrete. All ready-mix concrete shall meet the ASTM C94 (latest edition).
4. The required strength of the concrete specified shall be produced in the actual construction in not more than 28 days after placing.
5. The rink slab shall be standard Portland with compression strength of 5,000 psi at 28 days. The cement content shall not be less than 564 lbs. per cubic yard. Fly ash shall not be used. Water-cement ratio shall not exceed 0.42 with air-entrainment and shall contain a high range water-reducing admixture as specified to produce the required properties.
6. Slump: Provide as follows:
 - a. All concrete containing water reducing and air-entraining admixture shall not exceed 3 inches on trucks prior to addition of the high range water-reducing admixture (superplasticizer).
 - b. All concrete containing the high range water-reducing admixture (superplasticizer) shall have a maximum slump of 7 inches, unless otherwise

directed by the Engineer.

TIES TO SECURE RINK PIPING

- A. Material: Nylon.
- B. Minimum Tensile Strength: 50 lbs.
- C. Minimum Band Width: 3/16 inch.

EXECUTION

INSPECTION

- A. The Contractor shall notify the Engineer a minimum of 7 days in advance of the covering of any rink refrigeration pipe or tubing so that necessary inspections can be accomplished. The Engineer's authorized representative must have inspected, witnessed pressure testing, and approved of all piping systems prior to covering them with concrete.

COLD FLOOR PIPING PRESSURE TESTS

- A. The rink floor piping, tubing, headers, and transmission mains shall be tested before covering with concrete. 4,000 PSI.
- B. The Engineer shall witness the testing. Provide 7 days notice to allow the Engineer to be on the Site.

SUBGRADE FILL AND GRADING

- A. The subgrade soil material shall be fine graded to the elevation shown on the Drawings $\pm 1/4"$.

FLOOR INSULATION

- A. Insulation board shall be installed as indicated on the Drawings by those skilled in the trade.
- B. Joints shall be offset as detailed on the Drawings.
- C. All cuts and miters shall be made by saw cutting.
- D. Apply 6 mil thick clear polyethylene sheeting under and over insulation.
- E. Overlap poly sheeting 12 inches in all directions when installing.

F. Tape all joints of poly sheeting continuously with compatible tape.

TUBING SPACER/SUPPORTS

A. Spacers shall be installed 2 feet on center.

B. Fasten any piping not sufficiently held in place with the nylon ties specified.

RINK FLOOR REINFORCEMENT

A. Install steel rebar and mesh as shown on the Drawings.

B. The rebar shall be installed so that the lower bars run the long dimension of the rink and the upper bars run the short dimension of the rink. Bars shall be tied at every other crossing and the ends of the ties turned downwards.

C. Wire mesh shall be installed with a 6-inch lap on all edges. Mesh shall be tied a minimum 2 feet on center, or more if necessary to firmly fasten the mesh to the underlying piping and rebar. Ends of all ties shall be turned down.

RINK FLOOR TUBING

A. All tubing shall be continuous. Joints will be allowed only at connections to headers and return bends.

B. Tubing shall be tied at each support with the nylon or wire ties, unless supports incorporate an integral hold-down mechanism. Ends of ties are to be turned downward so as not to protrude above finished floor.

C. The interior piping at fusion welded joints, wherever possible, shall be visually inspected to verify joints are formed to manufacturer's specifications. All joints between the header, riser pipes, and the tees shall be inspected before fusion welding rink tubing to the tees to assure there is no blockage.

D. Tolerance:

1. All refrigerant piping shall be within +/- 1/4 inch of the specified elevations shown on the Drawings.

2. Note: 4 inch by 4 inch plastic shims shall be used if necessary for adjusting elevations of pipe supports as shown on the Drawings.

CONCRETE ICE RINK PLACEMENT

A. General:

1. Rink floor shall be made in one continuous pour. The concrete criteria shall be as herein specified and as noted on the Drawings and details.

2. All concrete used in the floor slab shall be placed by a method approved in every detail by both the Engineer and the Ice System Contractor.
3. The concrete supplier shall provide one or more standby trucks to cover the possibility of breakdown or load rejection.
4. The Contractor shall have standby pumping equipment on the Site in the event of primary equipment breakdown. Hand pushed wheelbarrows are not an acceptable standby method.
5. Provide rubber tires and plywood under pump piping couplings located across unpoured rink area if concrete placement is by pumping method.
6. The Contractor shall provide suitable containers (such as steel roll-off waste containers) for use as wash-out vessels for ready-mix concrete trucks during the rink concrete pours. Trucks shall not be washed-out into ponds, low areas, or elsewhere on the Site.

B. Pre-Placement Inspection and Tests:

1. Contractor: Before placing of concrete, inspect the formwork installation, reinforcing steel, pipe, and all items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required.
2. Engineer: After completion of all installations and inspection by Contractor, all Work will be inspected by the Engineer prior to the placement of concrete. Contractor shall plan and coordinate the Work to provide 72-hours
3. Tests: advance notice that the Work will be ready for the concrete placement.
 - a. All testing of the ice rink piping shall be completed as specified elsewhere in these Specifications.
 - b. Contractor shall coordinate the proposed pouring schedule to permit ample time for completion of tests and corrective measures, if required, and re-testing as necessary.
 - c. Prior to concrete placement, a certified survey shall be performed by the Contractor in a 12-foot grid pattern over the entire ice rink surface area and recorded in permanent format, which correctly identifies each elevation with its location in the rink. This data shall be submitted to the Engineer.
4. Acceptance: Concrete shall not be placed until authorization to proceed is furnished by the Engineer.

C. Concrete Placement: Comply with ACI 304, and as herein specified:

1. Before depositing concrete, the rink area shall be free of water, frost, loose or softened earth; the area shall be cleaned of all debris.
2. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation of aggregate due to rehandling or flowing. No concrete that has been partially hardened or been contaminated by foreign materials shall be deposited in the rink area, nor shall retempered concrete be used.

D. Hot Weather Placing: When hot weather conditions exist and the daytime temperature is expected to reach or exceed 80 degrees or more, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperature at time of placement below 75 degrees. Wet form thoroughly before placing concrete.

E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306.

F. Concrete Testing: Ice Rink Contractor shall coordinate, perform, and pay for all of the following tests:

1. Concrete Strength Tests:

- a. Mold and cure three specimens from each sample in accordance with ASTM C31 (latest edition). Any deviations from the requirements of ASTM C31 (latest edition) shall be recorded in the test report.
- b. Test specimens in accordance with ASTM C39 (latest edition). Two specimens shall be tested at 28 days for acceptance and 1 shall be tested at 7 days for information. The acceptance test results shall be the average of the strengths of the 2 specimens tested at 28 days.
- c. Make at least 1 strength test for each 100 cu. yds., or fraction thereof, of each mixture design of concrete placed in any 1 day.
- d. A copy of the test results shall be furnished to the Engineer as soon as available.
- e. All costs of concrete cylinder testing shall be paid by the Contractor.

2. Concrete Slump Tests:

- a. Determine slump of concrete before and after adding superplasticizer from each truck in accordance with ASTM C143 (latest edition). The first 3 truck loads each day shall be tested and every third truck load thereafter.
- b. If slump does not meet Specifications, remove batch from work and dispose of off Site.

3. Concrete Air Content Tests:

- a. Determine air content of concrete before and after adding superplasticizer from each truck in accordance with ASTM C231 (latest version). The first 3 truck loads each day shall be tested and every third truck load thereafter.
- b. If air content does not meet Specifications, remove batch from Work and dispose of off Site.
- c. Air content shall be tested prior to and after adding superplasticizer.

4. Concrete Temperature:

- a. Determine temperature of concrete from each truck. The first 3 truck loads each day shall be tested and every third truck load thereafter.

G. Consolidation: Where a surface mortar is to be the basis of the finish, the course aggregate

shall be worked back from the forms with a suitable tool to bring a full surface of mortar without the foundation or excessive surface voids. All concrete shall be consolidated by vibration at point of placement so that the concrete is thoroughly worked around the reinforcement, around embedded items, into corners of forms, eliminating all air or stone pockets which may cause honey-combing, pitting, or planes of weakness to insure total encasement. Road, Morrison, and vibrating screeds will not be acceptable. Mechanical vibrators (two required) shall have a minimum frequency of 8,000 revolutions per minute and shall be operated by competent personnel. Over-vibrating and the use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, from 18 to 30 inches apart. At each insertion, the duration shall not be sufficient to cause segregation, generally from 5 to 15 seconds duration. A spare vibrator (3 total) shall be kept on the Site during all concrete placing operations.

H. Placement: Entire rink pour level must be maintained by the constant use of a laser device during the wet screeding operation. No water may be added to the concrete at any time. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when bleed water has disappeared. Floating operation to be either machine or hand finished to make surface smooth by means of a rigid surface float. Cut down high spots and fill low spots. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Provide tooled joints at locations shown on the drawings. Joints shall be tooled to a maximum depth of $\frac{1}{2}$ ". Joints shall not be sawcut.

It shall be the Contractor's responsibility to provide a fogging system or chemical finishing aids if required to prevent rapid surface moisture loss, which may cause blistering of concrete:

1. Trowel Finish: Apply light fuzz trowel finish to slab surfaces. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Use of water without a finishing agent during final trowel finishing is not acceptable. Consolidate concrete surface by final machine-troweling operation, free of trowel marks, uniform in texture and appearance. To prevent damage to the surface, the troweling shall be stopped before a "burned in" finish is produced.

Elevation of top of rink slab must be set by use of laser leveling equipment to within a tolerance of plus or minus $\frac{1}{4}$ inch from a true level plane. Surface elevation variation greater than the plus or minus $\frac{1}{4}$ inch tolerance will result in rejection of the slab.

I. Curing and Protection:

1. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures, and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening, a minimum of 14 days:

- a. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

Port Austin Four
Seasons Pavilion
Port Austin, Michigan

2. Curing Method: Perform curing of concrete by moist curing. Provide moist curing as follows:

- a. Entire rink slab shall be covered with 6-mil poly sheeting as soon as possible after finishing and maintained in a covered condition for a minimum of 14 days. Water shall be added beneath the poly on a daily basis or as necessary to ensure the concrete surface is constantly wet.
- b. After the moist curing period is completed, the poly sheeting may be removed. However, the rink slab shall not be cooled by the refrigeration system for a minimum of 28 days after the pour.

END OF SECTION

SECTION 123661.16 - SOLID SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material Sills
2. Solid surface material wall base

1.2 ACTION SUBMITTALS

A. Product Data: For Sill and Wall Base materials.

B. Sustainable Design Submittals:

1. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For Sills and Wall Base: Show materials, finishes, edge profiles and methods of joining.

D. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 SOLID SURFACE MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Basis-of-Design Product: Subject to compliance with requirements, provide E. I. du Pont de Nemours and Company; Terra Collection or a comparable product by one of the following:
2. Type: Provide Standard type unless Special Purpose type is indicated.

3. Colors and Patterns: Refer to drawings.

- B. Composite Wood Products: Products shall be made without urea formaldehyde.
- C. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 FABRICATION

- A. Sills and Wall Base: ~~1/2-inch-~~ (12.7-mm-) thick, solid surface material.
- B. Joints: Fabricate sills without joints where possible.
- C. Edges: Ease all exposed outside corners and provide edge profile as shown in drawings.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
- B. Sealant: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.
- F. Install aprons to backing and countertops with adhesive.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be

installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

- H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes metal building systems that consist of integrated sets of mutually dependent components including the following:
 - 1. Structural-steel framing.
 - 2. Metal roof panels.
 - 3. Translucent panels
 - 4. Metal Soffit Panels
 - 5. Roof and wall thermal insulation.
- B. Related sections for work by other trades
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete foundations, slabs and tie-rods.
 - 2. Division 8 sections for exterior doors and storefront windows.
 - 3. Division 9 Sections for interior finishes.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and attachments to other work.
- C. Shop Drawings: Include plans, elevation, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Anchor-Bolt Plans: Submit anchor-bolt plans before foundation work begins. Include location, diameter, and projection of anchor required to attach metal building to foundation. Indicate column reactions at each location.
 - 3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications, Include transverse cross-sections.
 - 4. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
- D. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 1. Name and location of Project.
 2. Order number.
 3. Name of manufacturer.
 4. Name of Contractor.
 5. Building dimensions including width, length, height, and roof slope.
 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 7. Governing building code and year of edition.
 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- C. Material test reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.7 WARRANTY

- A. Special Warranty on Metal Panel Finishes: 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.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Butler Manufacturing Company
- B. Subject to compliance with requirements, the following manufacturers are also acceptable:
 - 1. VP Buildings, Inc
 - 2. Ceco Building Systems; Division of Robertson-Ceco Corporation.
 - 3. Nucor Building Systems.
 - 4. Star Building Systems; Division of Robertson-Ceco Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, licensed in the State of Michigan to design metal building system.
- B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As indicated on Drawings and in compliance with the 2015 Michigan Building Code.
 - 2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
 - 3. Deflection and Drift Limits: No greater than the following:
 - a. Rigid Frame: Vertical deflection of 1/360 of the span.
 - b. Purlins supporting basketball backstops: Vertical deflection of 1/360 of the span.
 - c. Other purlins: Vertical deflection of 1/150 of the span.
 - d. Girts supporting the top of the masonry wall: Horizontal deflection of 1/400.
 - e. Girts supporting the east wall clerestory windows: Horizontal deflection of 1/240 of the span.
 - f. Other girts: Horizontal deflection of 1/120 of the span
 - g. Metal Roof Panels: Vertical deflection of 1/150 of the span.
 - h. Metal Wall Panels: Horizontal deflection of 1/180 of the span.

- i. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - j. Lateral Drift at the Eaves: Maximum of 1/160 of the eave height.
- C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- D. 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: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
 - 1. Wind Loads: As indicated on Drawings.
- F. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- G. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- H. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- I. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- J. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- K. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
 - 1. Fire/Windstorm Classification: Class 1A-90.
- L. Thermal Performance for Opaque Elements: Provide the following maximum Assembly U-factors to comply with the Michigan Building Code 2015 and ASHRAE 90.1-2016
 - 1. Roof: 0.031
 - 2. Walls: 0.050

2.3 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters and rake beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - 2. Frame Configuration: Single gable.
 - 3. Exterior Column: Tapered.
 - 4. Rafter: Tapered.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating.
- G. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

2.4 METAL ROOF PANELS

- A. Standing-Seam, Vertical-Rib, Metal Roof Panels Butler Manufacturing "MR-24 roof system." Form with interlocking ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
 - 1. Material: 24-gauge Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - a. Exterior Finish: Two-coat fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Clips: Two-piece floating to accommodate thermal movement.
 - 3. Joint Type: Mechanically seamed.
 - 4. Panel Coverage: 24 inches (610 mm).
 - 5. Panel Height: 2 inches (51 mm) (2-3/4 inches with seam).

2.5 TRANSLUCENT PANELS

- A. Uninsulated Translucent Panels: Glass-fiber-reinforced polyester, translucent plastic; complying with ASTM D3841, Type CC2 general purpose), Grade 1 (weather resistant); smooth finish on both sides. Match profile of adjacent metal panels.
 - 1. Wall Panel Weight: Not less than 6 oz./sq. ft. (1831 g/sq. m).
 - 2. Light Transmittance: Not less than 50 percent according to ASTM D1494.
 - 3. Metal Edge: Fabricate full length of each side of panel with metal edge for seaming into standing-seam roof panel joint.
 - 4. Color: White

- A. Mastic for Translucent Panels: Nonstaining, saturated vinyl polymer as recommended by translucent panel manufacturer for sealing laps.
- B. Performance:
 - 1. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.6 METAL SOFFIT PANELS

- A. General: Provide factory-formed 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 and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels:
 - 1. Finish: White.

2.7 THERMAL INSULATION

- A. Delegated Design for Thermal Performance.
 - 1. Metal Building manufacturer to provide the most economical design for thermal performance of the wall and roof systems that will comply with Michigan Building Code 2015 and ASHRAE standard 90.1-2016, for climate zone 6A-Cold Humid.
 - 2. Insulation system to consist of multiple layers of insulation (if required), thermal spacers and thermal blocks and required insulation support materials.
 - 3. Design to maximum assembly U-Factors specified.
 - 4. Final exposed layer of roof and wall insulation to be furnished with a facing as specified.
- B. Basis of Design: Owens-Corning Fiberglas.
 - 1. Other insulation manufacturers approved by the specified metal building manufacturers, are also acceptable.
- C. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- D. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- E. Retainer Strips: For securing insulation between supports, 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.
- F. Roof and Wall Insulation Facing: "Gymguard".
 - 1. 0.0015-inch-thick, white metalized polypropylene film, reinforced with glass-fiber scrim.

2. Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket.
3. Assembly of insulation Blanket and Facing:
 - a. Flame Spread Rating: Less than 25.
 - b. UL Label: Submit as specified in Submittals article of this section.
 - c. Perm Rating: 0.02.

2.8 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 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.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
- C. Snowguards: As recommended by Butler Manufacturing and compatible with MR-24 roof system.
 1. Provide quantity and size to accommodate the snow loads for Johannesburg, Michigan.

2.9 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.10 SOURCE QUALITY CONTROL

- A. Special Inspection: The Construction Manager will engage a qualified special inspector to perform source quality control inspections and to submit reports.
 - 1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 1. Tighten rod and cable bracing to avoid sag.
 2. Locate interior end-bay bracing only where indicated.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.2 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 1. Install ridge caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 1. Install clips to supports with self-drilling or self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 6. Provide metal closures at peaks, rake edges and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.3 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 1. Install ridge caps as metal roof panel work proceeds.
 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 1. Install clips to supports with self-drilling or self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 6. Provide metal closures at peaks, rake edges and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.4 METAL SOFFIT PANELS

- A. General: Provide factory-formed 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 and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels:
1. Exterior - To be selected from Manufacturer standard selection
 2. Interior - Multi Purpose Rom 110 -Finish: White.

3.5 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
 4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- B. Blanket Roof and Wall Insulation: Comply with the following installation methods, per the delegated design system being provided:
1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
 2. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping

- adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.
3. Over-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Install layer of filler insulation over first layer to fill space formed by metal roof panel standoffs. Hold in place by panels fastened to standoffs.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 4. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 5. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.6 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 roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- 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. 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 (600 mm) of corner or intersection. Where lapped or bayonet-type 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
- C. Snowguards: Install per manufacturer's written instructions.

1. Use compression type connections to the standing roof seams. Do not penetrate roof panels.

3.7 FIELD QUALITY CONTROL

- A. Special Inspections: The Construction Manager will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or SSPC-SP 3, "Power Tool Cleaning."
 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

END OF SECTION 133419

SECTION 22 05 00 - PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 22 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 22 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 22 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some plumbing, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational plumbing systems as specified under Division 22 and as called for on the drawings. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material,

labor, etc., to furnish and install a completely operational plumbing system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

- A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, plumbing fixtures, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material, which has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials, manufacturer's capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in pipe shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. PE: Polyethylene plastic.
 - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.6 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.

- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
1. American Gas Association (AGA)
 2. American National Standard Institute (ANSI)
 3. American Society of Mechanical Engineers (ASME)
 4. American Society for Testing materials (ASTM)
 5. American Water Works Association (AWWA)
 6. American Welding Society
 7. ANSI code of Pressure Piping and Unified Pressure Vessels
 8. Cast Iron Soil Pipe Institute
 9. National Electrical Manufacturer's Association (NEMA)
 10. Standards of the Hydraulic Institute
 11. Underwriters' Laboratories (UL)
 12. Williams-Steiger Occupational Safety & Health Act (OSHA)
- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply.

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic sets of complete shop drawings for all plumbing equipment and materials associated with Division 22 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.

1.9 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, plumbing piping, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.
- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.

1.13 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include

contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.

- B. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, plumbing, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.
- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractor's letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class

quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.

- B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.
- C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the plumbing systems as is intended by these drawings and specification.

1.18 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.
- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner.
- C. All equipment, plumbing piping, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instructions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.
- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.

- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, plumbing, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, equipment etc. is adequate for the intended purpose and will result in a first class installation. Regardless of drawings, responsibility for first class operating systems rests with the Contractor.
- K. Arrange for chases, slots, openings, etc. and other building components to allow for plumbing systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, floors or other structural or architectural components.
- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.
- Q. The Mechanical Trade shall be responsible for all coordination of all site utilities, the gas company, etc. including coordination of all new and existing natural gas loads.

1.19 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- C. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.20 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the plumbing system installation with all other trades, existing conditions, etc.
- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.21 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 22 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.22 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing.

1.23 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 22. This work shall be performed by trades normally performing this type of work except drilling of holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling

all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.24 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.
- B. All existing equipment, plumbing, piping, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.
- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing plumbing, piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.25 ACCESS TO EQUIPMENT, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved, UL labeled and fire rated and shall be located and sized to allow access to equipment, valves, etc.

- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.26 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.27 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.

1.28 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 22, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.
- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.

G. All displays on control panels shall be on face of the panels.

1.29 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 22 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.
- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.
- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a 1/2" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.
- G. Furnish and install properly sloped sheet piled, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.
- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in

depth and carefully compact by hand or machine. Do not backfill with frozen materials.

- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.30 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 22 unless otherwise noted on drawings.
- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.
- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 22. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.
- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, plumbing, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.

- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and plumbing, piping roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required).

1.30 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for plumbing piping, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.
- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up ¼" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.
- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼" all around bare pipe or insulation.
- E. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- F. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-rated assembly, seal all voids with non-hardening sealant.
- G. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- H. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to Link-Seal, with stainless steel nuts and bolts on fasteners.

1.31 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 22 whether furnished by this contractor or by the Owner or other trades.

1.32 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.33 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.
- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.34 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- C. Refer to individual Division 22 piping Sections for special joining materials not listed below.
 - 1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - 1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - b. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.35 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.
- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"
8 inch	16 feet	--	4 feet	7/8"
10 inch	16 feet	--	4 feet	7/8"
12 inch	20 feet	--	4 feet	1"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.

- D. Hangers for Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.
- E. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- J. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- K. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.
- L. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- M. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- N. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- O. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.36 PLUMBING, PIPING, AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6' on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.

- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.37 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as toilet rooms, areas or wings of the building, etc.

1.38 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.
- C. Thoroughly clean all floor drains, cleanouts, and plumbing fixtures. Clean all trays and strainers.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 22 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.39 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.40 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

1.41 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

MAI: 2021-1551

SECTION 22 05 10 - PLUMBING SYSTEMS TESTING, CLEANING, WATER TREATMENT & STARTUP

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing of piping systems.
- B. Cleaning of piping systems.
- C. Chemical treatment.
- D. Substantial completion check list and sign-off forms.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself, but is supplementary to the entire specification and drawings.

1.3 SCOPE OF WORK

- A. The work covered by this specification consists of furnishing all labor, equipment, material, chemicals or methods that are mentioned, listed or scheduled on drawings or are in this specification. This includes all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the cleaning, flushing, testing and chemical treatment of the piping systems for this project. The work covered under this section of the specification is in no way complete within itself, but is supplementary to the entire specification and drawings.
- B. The substantial completion forms shall be required to be signed and submitted to the Architect/Engineer for approval prior to any insulation of piping systems or installation of ceiling tiles. The person that signs the substantial completion forms shall witness the testing, flushing and chemical treatment of the systems. The signature person's company shall be responsible for all cost incurred with future work by the Architect/Engineer or Owner due to inadequate testing, cleaning, operation or chemical treatment of the piping systems.

1.4 SUBMITTALS

- A. Submit electronic copies of the completed and signed substantial completion forms included in this section. Submit to the Architect/Engineer as system flushing, testing, and chemical treatment occurs. The Mechanical Trade shall maintain one set of substantial completion forms and submit them to the Architect/Engineer prior to the Architect/Engineer final project walk-through.

- B. Submit electronic copies of all equipment, chemicals and product data being furnished to this project for approval.
- C. Submit electronic copies of manufacturer's installation instructions, including placement of equipment in systems, piping configuration, and connection requirements.
- D. Submit certificate of compliance from authority having jurisdiction, indicating approval of systems that require review by local and state authorities.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual installation locations of piping and equipment including sampling points and location of chemical injectors.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and for public sewage systems.
- B. Products requiring electrical connection and listed and classified by UL as suitable for the purpose specified and indicated.

1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of treatment systems and system water for one year from date of substantial completion.
- B. Provide monthly technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report to Owner after each visit.
- C. Provide laboratory and technical assistance services during this maintenance period.
- D. Provide training course for Owner's personnel, instructing them on installation, care, maintenance, testing, and operation of the water treatment systems. Arrange course at startup of systems.
- E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based on these inspections.

1.8 MAINTENANCE MATERIALS

- A. Provide sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 WATER METER

- A. Displacement type cold water meter with sealed, tamper-proof magnetic drive, impulse contact register, single pole, double throw dry contact switch.

PART 3 - EXECUTION

3.1 SANITARY AND STORM PIPING SYSTEMS

- A. Testing
 - 1. Conduct a water, air or peppermint test on the entire system in accordance with the State Plumbing Code. Test underground sanitary, storm and vent piping with at least a 10 foot head of water.

3.2 DOMESTIC COLD WATER, HOT WATER & HOT WATER RETURN PIPING SYSTEMS

- A. Testing
 - 1. Before any fixtures are connected, hydrostatically test piping system at 1.5 times the maximum system pressure, but not less than 100 psig in excess of working pressure for (4) hours. This pressure to be on piping only, not equipment.
- B. Cleaning, flushing and disinfection.
 - 1. All domestic water piping and equipment shall be completely flushed out and disinfected before placing system in service. Disinfection procedure and results shall be in accordance with all applicable codes and State Department of Public Health. (Piping shall be flushed until water is clear).
 - 2. Ensure pH of water to be used as treatment is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or Acid (hydrochloric).
 - 3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L (50ppm) minimum residual.
 - 4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
 - 5. Maintain disinfectant in system for 2 hours.
 - 6. If final disinfectant residual tests less than 25 mg/L, repeat test.
 - 7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L or 0.5 ppm maximum.
 - 8. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and water entry, and analyze in accordance with AWWA-C51.
 - 9. Verify that all tests and results are in accordance with local and state health codes and regulations.

3.3 NATURAL GAS PIPING SYSTEMS

- A. Pressure Test
 - 1. Pressure test shall be per the current adopted edition of the International Fuel Gas Code.
 - 2. The test pressure shall not be less than 1.5 times the working pressure but not less than 3 PSIG. Where the test pressure exceeds 125 psig, the test pressure shall not exceed a value that produces a hoop stress in the piping

greater than 50 percent of the specified minimum yield strength of the pipe. The test duration shall be not less than ½ hour for each 500 FT³ of pipe volume. If testing a system with less than 10 FT³ of pipe volume the test shall not be less than 10 minutes.

3. The test medium shall be air, nitrogen, carbon dioxide or an inert gas. Oxygen shall not be used.

3.4 SYSTEM COMPLETION CHECKLIST

- A. The checklist which follows this specification section is to be considered part of the specifications.
- B. The checklist is to be completed by the Installing Contractor and the prime Mechanical Contractor for each item as directed.

END OF SECTION

MAI: 2021-1551

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Plumbing Systems						
Testing of Sanitary and Storm Systems	48 hours					Tested per specification
Testing of Domestic CW, HW and HWR Piping.	48 hours					Tested per specification
Disinfection of Domestic CW, HW & HWR Piping.	48 hours					Disinfect per specification and all applicable codes.
Domestic Water Sample and Approval	When submitted					Submit sample for review and approval by local authorities.
Natural Gas Piping	7 days					Tested per specifications.
Domestic water heater system, completely installed, checked, tested and started	7 days					Verify system installation complete, operation correct. Includes verification of hot water recirculating pump system and flow balance. Check, test and startup by Manufacturer's Rep.
Valving	When completed					Verify that valves have been installed at all branch piping locations
Piping and Fitting Insulation	When Completed					Verify all piping and fitting are insulated per specification.
Reduced Pressure Backflow Preventer Tested	48 hours					Verify Reduced Pressure Backflow Preventer installed and completely operational.
Sump Pumps and Sewage	48 hours					Verify system installation complete and

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

New Structure and Facility For:
 Port Austin Four Seasons Pavilion
 Port Austin, Michigan

PROJECT NO. 2021120

Ejectors						operational.

SYSTEMS COMPLETION CHECKLIST						
Inspection/Review Item	Notice Required	Installing Contractor		Date	Owner's Representative Signature	Remarks
		Name	Signature			
Plumbing Systems, Continued						
Pipe Labeling and Valve Tagging Identification	When completed					Verify system identification is complete per specification and valve chart submitted.
Owner's Training	7 days					Verify that Owner has been instructed on operation and maintenance of systems.

By signing this form, the Contractor is certifying that he has personally witnessed completion of that item, and it is complete and complies with all respects to the drawings and specifications.

All items are to be signed off on and submitted to MacMillan Associates Inc. before a final project walk-thru by the Engineer is requested. If the Engineer discovers items incomplete and/or not in accordance with this checklist, the drawings, or the specifications, the Contractor will be backcharged for the Engineer's time and expenses.

SC-3

SECTION 22 05 53 - PLUMBING SYSTEM IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Medical Gas Systems: Supply of pipe labels for placement by this Section.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI or equal standards for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit list of working, symbols, letter size, and color coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. $\frac{3}{4}$ to $1\frac{1}{4}$ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{1}{2}$ inch high letters.
 - 2. $1\frac{1}{2}$ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, $\frac{3}{4}$ inch high letters.
 - 3. $2\frac{1}{2}$ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, $1\frac{1}{4}$ inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, $2\frac{1}{2}$ inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, $3\frac{1}{2}$ inch high letters.
 - 6. Ductwork and Equipment: $2\frac{1}{2}$ inch high letters.
- B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color: Match existing or conform to ANSI/OSHA standards.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

- A. Description: Steel with $\frac{3}{4}$ inch diameter color coded head.
- B. Color code as follows:
 - 1. Green - Plumbing valves

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

MAI: 2021-1551

SECTION 22 06 00 - PLUMBING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General information for piping systems, plumbing fixtures, backflow preventers, water heaters, sump and sewage pumps, etc. and general installation information.

1.2 FIELD MEASUREMENTS

- A. Field verify all equipment and fixture locations.
- B. Confirm that mill work is constructed with adequate provisions for the installation of countertop plumbing fixtures.
- C. Confirm all mounting heights and locations of plumbing fixtures to meet all barrier free and American Disabilities Act codes and regulations.

1.3 EQUIPMENT, FIXTURE & MISCELLANEOUS SPECIFICATIONS

- A. All equipment, plumbing fixtures, specialties, etc. that have been scheduled on drawings shall have the manufacturer's specification automatically included as part of this specification. All "approved substitute" or "voluntary alternate" equipment fixtures, etc. shall meet the capacities, quality, etc. of the scheduled items specification and capacities.

PART 2 PRODUCTS

2.1 PIPE AND PIPE FITTINGS

- A. See Section 22 10 00 for Plumbing Piping.

2.2 MATERIALS AND FINISH

- A. Fixtures shall be of best quality vitreous china, acid resisting enameled cast iron or stainless steel, free from discoloration, chips, dents, warps, flaws, cracks, scratches, etc. or other blemishes. All vitreous china and enamel shall be white unless otherwise noted. Fixtures shall have manufacturer's guarantee label or trademark indicating first quality.
- B. All exposed pipe, fittings, traps, wastes, faucets, valves, handles, escutcheons, bolts, screws and accessories shall be polished chrome plated brass unless noted otherwise. Exposed traps shall be chrome plated brass, adjustable with cleanout plug and escutcheon.

2.3 PLUMBING FIXTURES - GENERAL

- A. Furnish all fixtures as shown and scheduled on drawings.
- B. Unless noted as "no substitutions", similar fixtures by the following manufacturers with equal or better qualities will be accepted as equal for:

1. Drainage Specialties - Josam, Sioux Chief, Smith, Wade, Watts, Zurn
 2. Plumbing Fixtures - American Standard, Bradley, Crane, Elkay, Fiat, Florestone, Just, Kohler, Mansfield, Moen Commercial, ProFlo, Sloan, Stern-Williams, Zurn.
 3. Plumbing Specialties - Schier, Watts, Wilkins, Zurn.
 4. Flush Valves - Delany, Delta, Sloan (Royal), Zurn, American Standard.
 5. Faucets - American Standard, Chicago, Delta, Sloan, T & S, Woodford, Zurn.
 6. Toilet Seats - Bemis, Centoco, Church, Olsonite, Kohler.
 7. Mixing Valves and Accessories - Powers, Symmons, Watts, Zurn, Reliance, Conbraco Appollo.
 - a. See 2.22 (this section) for emergency showers and eyewash stations.
 8. Electric Water Coolers and Drinking Fountains: Elkay, Halsey Taylor, Haws, Oasis.
- C. Provide all chair carriers, mounting hardware, etc. as required by the plumbing fixtures and wall construction. Where fixtures are located on walls, furnish and install suitable steel shapes well anchored in place and supported from floor as necessary to support fixtures. Each fixture shall be supported solidly and shall be sufficiently strong to withstand severe usage.
- D. Where plumbing fixtures occur in walls with pipe spaces in back of same, the supports for fixtures shall consist of chair carriers built into the wall with bolt projecting through face of wall for attachments of fixture brackets.

2.4 BACKFLOW PREVENTER

- A. Furnish and install type and quantity as shown on drawings or required by code. The Mechanical Trades shall furnish certification of all backflow preventers.
- B. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013 and AWWA C506; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer and four test cocks.
- C. Double Check Valve Assemblies: ANSI/ASSE 1012 and AWWA C506; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.5 WATER HAMMER ARRESTORS

- A. Furnish and install on systems as required by local and state plumbing codes, latest edition.
- B. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

2.6 DOMESTIC WATER HEATER

- A. Refer to drawings and furnish all.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert and rim elevations.
- B. Coordinate all rough-in and/or final connections to equipment and plumbing fixtures. Plumbing fixtures shall be located as required to meet all barrier free and American Disabilities Act codes and regulations.
- C. Coordinate all piping invert elevations, location, routing, etc. to allow proper drainage from all plumbing fixtures to sewer mains. Verify all services existing and new for elevations, locations, etc. before commencing installation.

3.2 FIXTURE CONNECTIONS

- A. In general, unless otherwise noted on the drawings, the sizes of all the branch connections to fixtures shall be no smaller than those listed in the following schedule and as required by local and state plumbing codes, latest edition:

Fixture	Waste	Vent	C.W.	H.W.
Lavatory	1¼"	1¼"	½"	½"
Sinks (General)	1½"	1½"	½"	½"
Janitor's Service Sink	3"	2"	½"	½"
Water Closet-Flush Valve	4"	2"	1¼"	---
Urinal-Flush Valve	2"	2"	1"	---
Wall Hydrants (Hose Bibb)	---	---	¾"	---
Drinking Fountain	1½"	1½"	½"	---
Showers	2"	2"	¾"	¾"

3.3 INSTALLATION

- A. Plumbing fixtures and trim shall be protected against damage during construction. Fixtures damaged during this period shall be replaced.
- B. All valves, waste and water supply piping servicing fixtures exposed beyond face of finished walls shall be brass, nickel, and chromium plated. Where fixtures are mounted in countertops and cabinet work concealing valves and piping, chrome plated brass finishes are not required.
- C. All fixtures shall be independently valved with either integral stops or brass stops.
- D. Waste connections to floor or wall outlet fixtures shall be gas and water-tight; fastened with an approved setting compound, gasket or washer. Rubber gaskets or putty are not acceptable. The fixture shall be set the proper distance from the wall or floor.
- E. Where flush valves are specified with fixtures, supply to valve in each room shall be set at same height for that type of fixture, and valve shall be set in place so that center line of valve discharge is directly above center line of fixture spud.

Bending of nipple between valve and spud to achieve connection will not be permitted.

- F. All brackets, cleats, plates, anchors, etc. required to support fixtures or piping rigidly in place shall be provided as work of this section and shall be installed behind finished walls.
- G. Provide and install basic fixtures from one major fixture manufacturer. Also, accessories such as faucets, strainers, stops, traps, etc. shall be manufactured by one major company where possible.
- H. All fixtures shall be set rigid, tight, plumb, level and true to assure rigidity and permanence. Provide chair carriers as manufactured by Wade, Josam, Zurn, or J.R. Smith for wall mounted fixtures. Carriers for wall mounted lavatories, drinking fountains, water coolers, and urinals shall have dual foot supports, tubular uprights, adjustable headers, alignment trusses, and all necessary accessories. Lavatory carriers shall be with concealed arms. Urinal carriers shall be with bearing plate. Water cooler and drinking fountain carriers shall be as required for proper support.
- I. All wall mounted fixtures shall be tested by bearing the weight of 500 pounds without sagging or pulling away from the wall. Damage resulting from this test shall be made good by this contractor. All other piping and fixtures shall be secured to walls with wall plates, wall hangers and approved expansion shields and bolts.
- J. Connections between earthenware fixtures and soil pipe flanges shall be made gas and water tight with closet setting compound or approved Neoprene gaskets, without use of putty. Hold down bolts shall be brass, not less than ¼" in diameter, and shall be equipped with nuts and washers.
- K. Provide each fixture with an approved compression service stop. Exposed stops shall be either loose key or screwdriver type.
- L. Caulk joint between wall and fixture at wall mounted lavatories, water closets, urinals, drinking fountains and service sinks with Silicone Sealant, white.
- M. Conductors:
 - 1. All inside conductors, except as otherwise specified, shall be caulked water tight and supported so as to provide for contraction, expansion and settlement of the building.
 - 2. All connections between outlet at roof drains and conductors shall be made and caulked watertight. Install all inside conductors and cooperate with the roofing contractor to properly install connections to the roof drains.
- N. Cleanouts:
 - 1. All soil, waste and drain pipes shall have cleanout at foot of stacks, outside near wall where line leaves building, at every change in the direction of run, at upper end of all horizontal runs, at intervals of not more than 100'-0" in straight runs of sanitary sewers and as required by code. All outlets shall be accessible so that drain line may be readily cleaned with a snake or other rodding tool. Extend cleanouts to finished floor or finished wall.
- O. Floor Drains

1. Floor drain pans shall be furnished and installed for all floor drains (except when floor drain is located in floors on fill) and be made of lead sheets weighting 4 lbs. per square foot or of an approved material, extending a minimum of 12" beyond lip of the flashing ring with outer edges turned up. All floor drains, floor sinks, etc. shall have deep traps installed.
 2. All fixtures shall be trapped if required by local or state plumbing codes.
 3. All trap seals that are subject to loss by evaporation shall have a trap seal primer valve installed as required by Local or State Plumbing Codes. A trap seal primer valve shall conform to ASSE 1018 or ASSE 1044.
- P. Flashings: Vent pipe flashings shall be by roofing contractor. Provide lead sleeves for vents.
- Q. Pipe relief from backflow preventer to nearest drain.
- R. Install water hammer arrestors as required by Code, complete with means for access if so required by the Plumbing Inspector.
- S. Cold water supply branch to each toilet room shall be provided with shock absorbers designed and sized as recommended by the manufacturer to eliminate water hammer.
- T. All exposed supplies and valves in finished areas shall be brass chrome plated. Supply lines to all hanging fixtures shall be from the wall, unless otherwise noted on drawings.
- U. Install shutoff valves on all branches. All water supplies to fixtures shall have valve on supply line to the fixture.
- V. All plumbing fixtures shall be installed, vented, piped, trapped, etc. in accordance with all codes and regulations pertaining to this projects location.
- W. Provide access to all thermostatic mixing valves and trap primer valves. If necessary, provide flush mounted stainless steel valve box with hinged cover and key lock.
- X. All fixtures supplied for bathing shall be supplied with a temperature control valve that conforms to ASSE 1016. All fixtures for hand washing shall be supplied with a temperature control valve that conforms to ASSE 1070.

END OF SECTION

MAI: 2021-1551

SECTION 22 07 00 - PLUMBING PIPE INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES PIPE INSULATION FOR:

- A. Domestic water piping system including cold water, hot water and hot water return.
- B. Outdoor piping.
- C. Valves and fittings.
- D. Miscellaneous.

1.2 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or end use:
- B. American Society for Testing of Materials Specifications:
 - 1. ASTM C547, "Standard Specification for Mineral Fiber Preformed Pipe Insulation"
 - 2. ASTM C533, "Standard Specification for Calcium Silicate Pipe & Block Insulation"
 - 3. ASTM C585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
 - 4. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)
- C. Insulation materials, including all water and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with the applicable project specifications and drawings, subject to the terms and conditions of the contract:
 - 1. Hot Piping - Piping system with fluids 105°F and higher.
 - 2. Cold Piping - Piping systems with fluids below 105°F. (Includes storm water systems)
- B. Insulation, vapor barriers, jacketing, hangers, supports, accessory materials, etc. shall be installed according to manufacturers recommendations.

1.4 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

1.5 SYSTEM PERFORMANCE

- A. Insulation material furnished and installed hereunder shall meet the minimum thickness requirements of Standard 90.1 (12007), "Energy Efficient Design of new Buildings" of the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) except minimum thickness shall be 1". However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of each of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriters' Laboratories, Inc. UL 723
 - 3. National Fire Protection Associations NFPA 255
- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.6 QUALITY ASSURANCE

- A. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- B. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 PIPE INSULATION ON INDOOR SYSTEMS

- A. Molded pipe insulation shall be manufactured to meet ASTM C585 for sizes required in the particular system.
- B. Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C547. Heavy density Fiberglas pipe insulation with factory applied all-service jacket (ASJ) and Doublesure* two-component adhesive closure system, or Fiberglas Pipe and Tank Insulation, heavy density fiberglass insulation with end grain adhered to ASJ all service jacket. Joints shall be sealed by butt strips having a two-component sealing system or by applying staples and pressure sensitive tape. When self-sealing lap systems are used, sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150°F. Manufacturer's data regarding thickness constraints in

relation to operating temperature shall be followed. When multiple layers are required, all inner layer(s) shall beunjacketed.

- C. Fittings and valves shall be insulated with preformed fiberglass fittings, fabricated sections of fiberglass pipe insulation, fiberglass pipe and tank insulation, fiberglass blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall match that used on straight sections.
- D. Flanges, couplings, chilled water pump impeller housings, valve bonnets etc, shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with sections of insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable vapor resistant mastic.
- E. On cold systems, vapor barrier performance is extremely important. Particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. Valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic.
- F. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.
- G. All insulated, exposed piping inside the building within 8'-0" above the floor shall be additionally jacketed with a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal.

2.2 PIPE INSULATION ON OUTDOOR SYSTEMS

- A. Piping located outdoors, with installation temperature above 40°F, shall be painted, insulated and covered with a weatherproof metal jacket as per the following:
 - 1. All existing and new surfaces shall be cleaned and free of dirt, dust, grease, rust or any other debris build-up on the piping. After proper cleaning, the surface shall be primed with Devoe Pre-Prime® 167 penetrating sealer and finished with a coat of Devoe Bar-Rust® 235 surface tolerant coating per the manufacturer's recommendations. The primer and finisher shall be applied and cured per the manufacturer's recommendations. Contractor shall protect all piping from elements during paint cure times.
 - 2. Insulation material shall be an EPDM rubber, flexible, closed-cell elastomeric insulation in tubular or sheet form: Aerocel Aerocel-SSPT with Cel-Link II, Aerocel W/G-SSPT with Cel-Link II for piping or Aerocel AC Sheet or Aerocel SA pressure sensitive adhesive sheet for duct and equipment. The product will be tested for and meet or exceed the requirements defined in ASTM C 534 for Type I and II, Grade 1. EPDM elastomeric insulation material shall be manufactured without the use of

CFC's, HFC's or HCFC's. EPDM elastomeric insulation shall have a flame-spread index of 25 or less and a smoke-developed index of 50 or less when tested in accordance with ASTM E 84, for all products through 2" thickness. This requirement applies to Cel-Link II closure, also. Product to be suitable for use from -297°F to 257°F continuous service temperature, per ASTM C 411. EPDM elastomeric insulation shall have a maximum thermal conductivity of 0.245 Btu-in./h-ft²-°F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518. EPDM elastomeric insulation shall have a maximum water vapor transmission of 0.03 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision. Product must exhibit long-term UV resistance, when unfinished in outdoor installations, per ASTM G 7 and ASTM G 90. EPDM elastomeric insulation must not contribute to external stress corrosion cracking as when tested by ASTM C 692.

3. Longitudinal seam closure is to be Stay-Seal with Protape and butting sections are to be joined with Cel-Link II pressure-sensitive closures. Closures must provide water and water vapor tight seal when tested in accordance with ASTM D 3816. VOC content must be no more than 1.3% when tested in accordance with ASTM D 3960. Closures must be capable of being sealed at a low temperature of 0°F. Closures must be kept free of dust, dirt, moisture, lubricants and other contaminants. Adhesive for fabrication work such as field-fabricated fittings and sheet seams shall be the insulation manufacturers recommended contact adhesive: Aerocel Aeroseal Adhesive or Aeroseal LVOC Adhesive. Optional insulation finish shall be the insulation manufacturer's recommended finish: Aerocel Aerocoat. Seaming tape to be 15-mil EPDM rubber with acrylic adhesive: Aerocel Protape. Elbows, suction line "P" traps, Tees and mechanical grooved pipe fittings are to be insulated with factory fabricated insulation fittings of EPDM flexible elastomeric, color matched to pipe insulation. Aerofit Insulating Fitting Covers. Accessories such as adhesives, mastics and cements shall not detract from any of the system ratings as specified above.
4. Insulated pipe support inserts will be high-density insulation with an inner lining of EPDM rubber insulating tape and an EPDM rubber exterior jacket: Aerocel Aerofix-U Pipe Hanger Inserts. Density of insulation is to be a minimum of 10 lbs./cu. ft., with a compressive strength of 284 P.S.I. or greater, and a k-value of .312 or lower, usage temperature range of -297°F to 257°F, water absorption of 5% or less. Exterior jacket is to be 15-mil thick EPDM rubber.
5. Insulating fitting covers for copper sweat x sweat 90 degree elbows, tee's and 45 degree elbows, and mechanical grooved fittings will be factory-fabricated insulating fitting covers. The insulating fitting covers are to be made of EPDM rubber, with inside diameter and insulation thickness to match material on straight run piping. Aeroflex USA Aerofit insulating fitting covers.
6. All piping, valves, fittings, duct, and equipment scheduled to be insulated shall is to have all insulation applied in strict accordance with manufacturer's installation instructions, and practices described in the

National Commercial and Industrial Insulation Standards Manual. Manufacturer's installation guidelines and instructions will be used if conflicts exist.

7. Insulating pipe saddles are to be installed at all pipe hanger and clamp locations. Saddles are to be installed at the time that piping is being installed, so that insulation system can be installed in a continuous manner through the pipe support system.
8. On outdoor cold pipes, the insulation system shall be completely vapor sealed before the weather-resistant jacket is applied. The outer jacket shall not compromise the vapor barrier by penetration of fasteners, etc.
9. Jacketing shall be a multi-ply, fabric reinforced, self adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E or equal with moisture barrier, installed in accordance with the jacket manufacturer's recommendations. Each section of jacketing shall overlap the adjoining section by 3". All seams shall be taped with Venture Clad joining/seaming tape. Place the wrap so that the edge of the sealing flap faces down.

2.3 SUPPORT FOR PIPE WITH INSULATION

- A. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that butt joints may be made outside the hanger.
 1. On all size piping of cold systems, the pipe hanger saddles shall be separated away from the pipe by utilizing inserts. The vapor barrier shall be continuous, including material covered by the hanger saddle.
 2. On warm water piping systems 3" in diameter or less, insulated with Fiberglas insulation, may be supported by placing saddles of the proper length and spacing, as designated in Owens-Corning Pub. 1-IN-12534, under the insulation.
 3. For hot or cold piping systems larger than 3" in diameter, Owens-Corning Calcium Silicate pipe insulation shall be used for high density inserts. Piping saddles for piping larger than 3" shall not be in contact with the piping.
 4. Owens-Corning Calcium Silicate pipe insulation may be used to support the entire weight of the piping system provided the hanger saddle is designed so the maximum compressive load does not exceed 100 psi.
 5. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
 6. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs

are encountered, expansion joints may be required where single layers of the insulation are being used.

7. On vertical runs, insulation support rings shall be used.

2.4 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
 1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes.
 2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 3. Support materials - Hanger straps, hanger rods, saddles.
 4. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".

2.5 INSULATION THICKNESSES

- A. Fittings, including valves, flanges, unions, etc. shall be insulated with the same thickness as the required pipe insulation and covered with PVC fitting cover as specified.
- B. Pipe insulation thickness shall be as follows unless noted otherwise on drawings:

<u>Piping System</u>	<u>Pipe Size</u>	<u>Insulation Thickness</u>	<u>Insulation Conductivity BTU-in H-FT²-F</u>
Domestic cold water	All sizes	1"	0.28
Domestic hot water and hot water return (140°F and under)	Up thru 1¼" 1½" and larger	1" 1½"	0.28
Domestic hot water and Hot water return (140°F to 200°F)	Up to 1¼" 1½" and larger	1 ½" 2"	0.28

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.

- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project may comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation. All damaged insulation installed will be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

3.3 INSTALLATION

A. General

- 1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
- 2. Install insulation on piping subsequent to installation of heat tracing, painting, testing, and acceptance tests.
- 3. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other. Butt insulation joints firmly to ensure complete, tight fit overall piping surfaces.
- 4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

B. Fittings

- 1. Cover valves, fittings, and similar items in each piping system using one of the following:
 - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
 - b. Insulation cement equal in thickness to the adjoining insulation.

- c. PVC fitting covers insulated with material equal in thickness and composition to adjoining insulation.

C. Penetrations

- 1. Extend piping insulation without interruption through walls, floors, and similar piping penetrations, except where otherwise specified.

D. Joints

- 1. Butt pipe insulation against hanger inserts. For hot pipes, apply 3" wide vapor barrier tape or band over butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints, and seal joints with 3" wide vapor barrier tape or band.
- 2. All pipe insulation ends shall be tapered and sealed, regardless of service.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing piping, valves, equipment, etc. where tie-ins are required, shall be removed by the Owner at Owner's expense. The contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

END OF SECTION

SECTION 22 10 00 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Sanitary and storm piping system.
- B. Domestic water piping system
- C. Natural gas piping system.
- D. Valves.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI B31.1 - Power Piping.
- B. ANSI B31.2 - Fuel Gas Piping.
- C. ANSI B31.9 - Building Service Piping.
- D. ASME - Boiler and Pressure Vessel Code.
- E. ASME Sec. 9 - Welding and Brazing Qualifications.
- F. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- G. ASME B16.3 - Malleable Iron Threaded Fittings.
- H. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
- I. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
- J. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
- K. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
- L. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- M. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- N. ASTM A47 - Ferritic Malleable Iron Castings.
- O. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded.
- P. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- Q. ASTM A106 - Carbon Steel Seamless Pipe.

- R. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- S. ASTM A536 - Ductile Iron Castings.
- T. ASTM B32 - Solder Metal.
- U. ASTM B42 - Seamless Copper Pipe.
- V. ASTM B43 - Seamless Red Brass Pipe.
- W. ASTM B75 - Seamless Copper Tube.
- X. ASTM B88 - Seamless Copper Water Tube.
- Y. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
- Z. ASTM B302 - Threadless Copper Pipe (TP).
- AA. ASTM B306 - Copper Drainage Tube (DWV).
- BB. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- CC. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- DD. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- EE. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- FF. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- GG. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
- HH. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- II. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
- JJ. ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe.
- KK. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- LL. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- MM. ASTM D2846 - Chlorinated Polyvinyl Chloride (CPVC) Pipe, Fittings, Solvent Cements and Adhesives for Potable Hot Water Systems.
- NN. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

- OO. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- PP. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- QQ. ASTM D3309 - Polybutylene (PB) Plastic Hot Water Distribution System.
- RR. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- SS. ASTM F493 - Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- TT. ASTM F891, Schedule 40 Cellular Core PVC-DWV Pipe.
- UU. AWS A5.8 - Brazing Filler Metal.
- VV. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- WW. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- XX. AWWA C111- Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- YY. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- ZZ. AWWA C606 - Grooved and Shouldered Joints.
- AAA. AWWA C651 - Disinfecting Water Mains.
- BBB. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- CCC. CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- DDD. NCPWB - Procedure Specifications for Pipe Welding.
- EEE. NFPA 54 - National Fuel Gas Code.

1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- C. Welders Certification: In accordance with ASME Sec 9.
- D. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

- E. All castings used for coupling housings, fittings, valve bodies, etc. shall be date stamped for quality assurance and traceability.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 SANITARY AND STORM SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Piping up thru 8": Cast iron ASTM A74 service weight with cast iron fittings ASTM C564 neoprene gasket system joints.
- B. Piping 10" and above: Reinforced concrete pipe with ASTM C-76 Class III specification when piping is located below a paved surface. All other pipe shall be reinforced concrete pipe with ASTM C-76 Class II specification. Joints shall be bell and spigot pattern with "Tylex" gasket material on sanitary piping or cemented joints with "Dewitt" No. 10 caulking around compound on storm piping. Joints shall conform to ASTM V-443.
- C. Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
 - 1. Fittings: PVC
 - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- D. Dual wall corrugated polyethylene pipe may be used for storm when approved in writing by the Engineer, pipe sizes thru 10" shall meet AASHTO M252S, pipe sizes 12" thru 36" shall meet AASHTO M294S. Corrugated pipe shall have smooth inner liner. Acceptable manufacturers shall be Hancor or ADS.

2.2 SANITARY, STORM AND VENT SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Gravity Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight

1. Fittings: Cast iron.
 2. Joints: ASTM C564, neoprene gasket system.
- C. Gravity Schedule 40 PVC Pipe: ASTM D2729 and ASTM F891 DWV non-pressure cellular core.
1. Fittings: PVC.
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- D. Gravity 10" and larger. Schedule 40 PVC gravity sewer pipe with integral bell and spigot joints.
1. Fittings: PVC
 2. Joints: ASTM D3212 flexible elastomeric seals.
- E. Forced PVC Pipe:
1. 4" and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
 2. Fittings: ASTM D2466 PVC
 3. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust block or ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- 2.3 SANITARY, STORM AND VENT PIPING, ABOVE GRADE (Must be approved by governing authorities)
- A. Gravity Cast Iron Pipe: ASTM A74, service weight.
1. Fittings: Cast iron.
 2. Joints: ASTM C564, hub and spigot, neoprene gasket system.
- B. Gravity Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. Gravity Steel Pipe: ASTM A53 Schedule 40, galvanized.
1. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, screwed fittings.
 2. Malleable Iron Fittings: ASME B16.3, screwed type. ASTM A47.
 3. Ductile Iron Fittings: Grooved end, ASTM A536.
 4. Mechanical Grooved Couplings: Ductile iron, galvanized. (as specified for Forced Drains)
- D. PVC Pipe: ASTM D2729 (when approved by the Architect/Engineer).
1. Fittings: PVC.
 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- E. CPVC Pipe: ASTM D2846 (When approved by the Architect/Engineer).
1. Fittings: ASTM D2846, CPVC
 2. Joints: ASTM D2846, solvent weld with ASTM F493 solvent cement.
- F. Forced larger than 3": Steel Pipe: ASTM A53, Schedule 40, galvanized.
1. Fittings: Galvanized steel.
 2. Joints: Grooved mechanical couplings.
 3. IPS Grooved Piping System.

- a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B31.9, ASME UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.
- b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturer's current listed standards conforming to ANSI/AWWA C-606.
- c. Mechanical couplings shall be Victaulic style 107H "Installation-Ready" or approved manufacturer, rigid coupling. Victaulic style 177 "Installation-Ready", and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.

2.4 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51 rated 350 psi with Class 350 fittings.
 1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27" minimum, rated 350 psi at laying condition Type 1.
 2. Cement lined as per AWWA C104 (ANSI A21.4)
 3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
 4. Fitting Joints: Mechanical, compact, ANSI/AWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
 5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
 6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
 7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.
 8. All material and installation shall be in accordance with manufacturer's recommendations.
- B. Copper Tubing: 2" and smaller - ASTM B88, Type K soft temper.
 1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP silver braze if allowed by code, otherwise ASTM B32 solder, lead free Grade 95-5 tin-antimony or tin-silver, with melting range of 430 to 535 degrees F.
- C. PVC Pipe:
 1. 2½" and 3" - ASTM D2241, SDR 21 - Class 200 AWWA C900.
 2. 4" and Larger - ASTM D2241, DR18-Class 150 AWWA C900.
 3. Fittings: ASTM D2466, PVC

4. Joints: ASTM D3139, integral bell and gasket seal installed with concrete thrust block or ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.5 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING (Must be approved by governing authorities)

- A. Ductile Iron Pipe: ANSI/AWWA C151/A21.51 rated 350 psi. with Class 350 fittings.
 1. ANSI thickness Class 50 minimum, nominal pipe wall thickness .27" minimum, rated 350 psi at laying condition Type 1.
 2. Cement lined as per AWWA C104 (ANSI A21.4)
 3. Pipe Joints: Push on, ANSI/AWWA C1533/A21.53, with Tyton gaskets.
 4. Fitting Joints: Mechanical, compact, ANSI/AWWA C153/A21.53, with stainless steel or Corten anti-rotation bolts and sacrificial zinc anode cap on each bolt.
 5. Coating: Exterior of pipe and fittings, asphaltic coating as per ANSI/AWWA.
 6. Polyethylene encasement as per ANSI/AWWA C105/A21.5.
 7. Concrete thrust blocks, installation, etc. as per published engineering and construction standards of Michigan Department of Transportation and local codes.
 8. All material and installation shall be in accordance with manufacturers recommendations.
- B. Copper Tubing: 2" and smaller - ASTM B88, Type K, soft temper.
 1. Fittings: ASME B16.18 cast bronze or ASME B16.22 wrought copper and bronze.
 2. Joints: AWS A5.8, BCuP silver braze.
 3. No joints shall be located under floor unless standard pipe lengths are not long enough for the entire length of bury, then joints shall be kept to a minimum.
- C. PVC Pipe
 1. 3" - ASTM D2241, SDR 21- Class 200 AWWA C900.
 2. 4" thru 12" - ASTM D2241, DR18 - Class 150, DR18 - AWWA C900.
 3. Fittings ASTM D2466, PVC.
 4. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.6 DOMESTIC WATER PIPING, ABOVE GRADE INSIDE BUILDING (Must be approved by governing authorities)

- A. Domestic water piping 6" and smaller shall be: Copper tubing: ASTM B88, Type L, hard drawn, seamless.
 1. Fittings: ASME B16.18 cast bronze tee tap or ASME B16.22 wrought copper and bronze.
 2. Fittings 1-1/2" and smaller: ASME B16.18 cast bronze or ASME B16.22 wrought copper, with 301 stainless steel internal components, EPDM seals, and push-to-connect ends. Victaulic Permalynx.
 3. Joints: ASTM B32, solder, lead free Grade 95-A tin - antimony or tin and silver with melting range 430 to 535 degrees F or AWS A5BcuP silver braze.

4. Fittings 2" and smaller: At the Contractor's option, Schedule 10S stainless steel pipe with Vic-Press 304 fittings and couplings may be used in lieu of soldered copper. The seal material shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
5. Joints 2" thru 8" may be mechanical pipe couplings of a bolted type with a central cavity design pressure-responsive gasket along with grooved end copper or bronze fittings as available, as manufactured by Victaulic.
 - a. Copper Tube, ASTM B-88 (Type K or L) - Roll grooved only, at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted).
 - b. Mechanical Couplings - Shall be Victaulic Style 607H "Installation-Ready" rigid couplings for copper consisting of a ductile iron cast housing, with offsetting angle-pattern bolt pads, a synthetic rubber gasket of a central cavity pressure-responsive design, with ASTM A449 plated nuts and bolts to secure unit together.
 - c. Coupling Housings - Shall be cast of ductile iron conforming to ASTM A-536 (Grade 65-45-12), with a copper colored enamel paint coating.
 - d. Gaskets - Shall be molded of synthetic rubber in a Flush-Seal configuration conforming to the copper tube size (CTS) outside diameter and coupling housing, of elastomers having properties as designated in ASTM D-2000. Reference shall always be made to the latest published Selection Guide for Gaskets for proper gasket selection for the intended service.
 - e. Water Service - Gasket supplied for water services from -30°F to +230°F Grade "E" EPDM compound molded of materials conforming to ASTM D-2000, designation 2CA615A25B24F17Z, recommended for hot water service within the specified temperature range, plus a variety of dilute acids, oil-free air, and many chemical services. Not recommended for petroleum services.
 - 1) Gaskets supplied with Style 607H couplings shall be grade EHP for water services from -30°F to +250°F.
 - 2) Gaskets shall be UL classified in accordance with ANSI/NSF61 for Potable Water service.
 - 3) Meets the low lead requirements of NSF-372.
 - f. Flange Adapters - Shall be Victaulic Style 641 Vic-Flange or equal adapters 2"-6", ductile iron ASTM A-536, engaging directly into roll grooved copper tube and fittings and bolting directly to ANSI Class 125 cast iron and Class 150 steel flanged components; installer to supply standard flange bolts. Flange casting shall have a corresponding gasket.
 - g. Fittings - Fittings shall be full flow (smooth turn elbows) copper fittings conforming with ASME B16.22 or cast bronze to ASME B16.18; with grooves designed to accept grooved end couplings at copper-tube dimensions. (Flaring to accommodate alternate sized couplings is not permitted). Victaulic Copper-Connection.
- B. Domestic water piping larger than 6" shall be: Steel pipe: ASTM A53, Schedule 40, galvanized.
 1. Fittings: Galvanized steel.
 2. Joints: Grooved mechanical couplings.
 3. IPS Grooved Piping System
 - a. Victaulic mechanical pipe couplings, fitting, valves and other grooved components may be used as an option to welding, threading or flanged

methods. All grooved components shall be of one manufacturer and shall conform to local code approval and/or as listed by ANSI B31.1, B 31.9, ASME, UL/FM IAPMO or BOC. Grooved end product manufacturer to be ISO-9001 certified.

- b. Roll or cut grooved ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends shall be grooved in accordance with manufacturer's current listed standards conforming to ANSI/AWWA C-606.
- c. Mechanical couplings shall be Victaulic style 107H "Installation Ready" or 07 (zero-flex) or equal, rigid coupling or style HP-70 or equal rigid coupling for high pressure service. Victaulic style 177 "Installation Ready" and style 77 or 75 or equal coupling shall be used where system flexibility is desired at pumps and other mechanical equipment to reduce noise and vibration. Noise and vibration reduction is achieved by installing (3) style 77 or 75 or equal flexible couplings near the vibration source. Couplings shall be of cast ductile iron conforming to ASTM A536, grade 65-45-12.
- d. Mechanical reducing couplings shall be Victaulic style 750 or equal for pipe runs for reduction on pipe sizes 4" thru 8".
- e. Meets the low lead requirements of NSF-372.

2.7 NATURAL GAS PIPING BURIED (Must be approved by governing authorities and local gas utility company)

- A. Approval must be given in writing by the local gas company for type of material to be used and the proposed installation method
- B. Polyethylene Pipe: ASTM D2513, SDR 11.5.
 - 1. Joints and Fittings: Plastic pipe and fittings shall be joined in accordance with manufacturer's instructions. Piping shall be allowed to be joined by methods of heat fusion, or mechanical fittings designed for pipe made to ASTM D 2513 Standards.
 - a. Heat fusion joints shall be made in accordance with manufacturer's recommendations and shall be made by certified personnel in accordance with qualified procedures proven to make gas tight joints as strong as the pipe or tubing being joined.
 - b. Mechanical joints shall be compatible with the plastic piping and gas in the system. A stiffener should be inserted when using OD compression type fittings. The stiffener should be sized specifically for the pipe being installed and should equal the insertion depth of the pipe. Split tubular stiffeners shall not be used.
 - 2. Continuous insulated No. 14 copper tracer wire shall be installed with and attached to underground non-metallic gas piping and shall terminate above grade at each end.
 - 3. Install polyethylene pipe a minimum of 24" below grade, backfill with clean yellow sand to 6" below grade, and install yellow plastic warning tape 6" below grade above the pipe.
 - 4. Polyethylene pipe entering or emerging from the ground at locations exterior from the building shall be additionally protected by encasing with ASTM A53, Schedule 40 black steel pipe to a height of, if practical, 18" below to 6" above the ground.

5. Piping penetrating below grade through a foundation or basement wall shall be encased with steel, wrought iron, PVC or ABS Schedule 40 piping. The circular space behind the piping and the sleeve shall be sealed.

2.8 NATURAL GAS PIPING, ABOVE GRADE INSIDE OF BUILDING OR OUTDOORS EXPOSED

- A. Steel Pipe: ASTM A53, Schedule 40 black.
 1. Fittings: ASME B16.3, malleable iron or ASTM A234, forged steel welding type.
 2. Joints: NFPA 54, threaded or welded to ANSI B31.1, ANSI B31.2, ANSI B31.9, ASME Sec. 9.
 3. If both ends of the pipe sleeve within the same building terminate indoors, the pipe sleeve shall not be sealed or vented.
 4. If one end of the pipe sleeve terminates outdoors and the other terminates indoors, the pipe sleeve shall be sealed and vented.
 5. Exterior piping shall be painted with paint for steel pipe and outdoor rated.

2.9 NATURAL GAS PIPING INSIDE BUILDING, BELOW GROUND, INSIDE SOLID WALLS OR SOLID FLOORS

- A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints, encased in a Schedule 40 steel, wrought iron, PVC or ABS pipe sleeve. The sleeve shall be sealed and capable of containing full gas pressure in the event of a leak in the gas pipe. The sleeve shall be vented to a vent located 12" min. above the roof with a cap to prevent the entrance of water and insects. All gas piping shall be in conformance with the National Fuel Gas Code NFPA 54, the requirements of the State Building Code, the local Fire Marshal and the Office of Fire Safety (OFS).
 1. The gas shutoff valves serving the Science Rooms shall be made accessible from the Corridor. Each shutoff valve shall be located in a recessed box furnished and installed by the General Contractor. Each shutoff valve shall serve to shut off all gas outlets in the one adjacent room only.
 2. All gas piping located below the floor shall be located under the concrete, not in the concrete, and shall be located a minimum of 12" below the top of the floor.

2.10 NATURAL GAS PIPING IN CONCEALED LOCATIONS

- A. Steel pipe, ASTM A53, Schedule 80, black iron with welded joints.
 1. A concealed location is a location that cannot be accessed without damaging permanent parts of the building structure or finish surface. Spaces above, below or behind removable panels or doors shall not be considered concealed.

2.11 PIPE HANGERS AND SUPPORTS

- A. Refer to Section 22 05 00.

2.12 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under:
 1. Ferrous pipe: 150 psig malleable iron threaded unions.

2. Copper tube and pipe: 150 psig bronze unions with soldered joints. (Solder shall be lead free.)
- B. Pipe Size Over 2 Inches:
 1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
 2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
 1. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)
 2. Housing: Two ductile iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion where required; electroplated steel bolts, nuts, and washers conforming with ASTM A449; galvanized for galvanized pipe.
 3. Sealing gasket: "C" shape or FlushSeal composition sealing gasket.
 4. Gaskets shall be UL classified in accordance with ANSI/NSF-61 for Potable water service.
 5. Basis of Design: Victaulic Company, Style 607H (Installation-Ready for Copper Tubing) and Style 107H or 177 (Installation-Ready for Steel Piping).
- D. Dielectric Connections: Dielectric nipples shall be non-conducting for connection of dissimilar materials. Dielectric nipples shall be similar to Victaulic Style 647 or Style 47. A brass adapter dielectric union is not acceptable.

2.13 GATE VALVES

- A. Up to and including 3 Inches: Bronze body, bronze trim, non-rising stem, handwheel, inside screw, single wedge or disc, solder or threaded ends.
- B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends. Basis of Design: Victaulic Series 771V.

2.14 GLOBE VALVES

- A. Up to and including 3 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, renewable composition disc, solder or screwed ends, with back seating capacity (repackable under pressure).
- B. Over 3 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

2.15 BALL VALVES

- A. Up to and including 3 Inches:
 1. Bronze one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.
 2. Brass two piece body, chrome plated brass ball and stem, PTFE seats and seals, lever handle, and Vic-Press ends. Victaulic Series P589.

- B. Over 1-1/2 Inches: Cast ductile iron steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, or gear drive handwheel for sizes 10 inches and over, flanged or grooved ends. Basis of Design: Victaulic Series 726.

2.16 PLUG VALVES

- A. Up to and including 3 Inches:
 - 1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of Design: Victaulic Series 608.
 - 2. Bronze body, bronze tapered lubricated plug, teflon packing, threaded ends.
- B. Over 3 Inches:
 - 1. Cast iron body and lubricated plug, flanged ends.
 - 2. Elastomer coated ductile iron plug with integrally cast stem, ductile iron body and bonnet, welded-in nickel seat, lever handle or gear operator. Basis of Design: Victaulic Series 377.
 - a. For installation on IPS / Steel pipe sizes with Victaulic Style 307 transition coupling.

2.17 BUTTERFLY VALVES

- A. Bronze body
 - 1. Elastomer coated ductile iron disc with integrally cast stem, copper-tube dimensioned grooved ends, lever handle or gear operator. Basis of design: Victaulic Series 608.
 - 2. Stainless steel disc, resilient replaceable seat, threaded ends, extended neck, 10 position lever handle.
- B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable pressure responsive EPDM seat, wafer or lug ends or grooved ends if Victaulic grooved fittings are used, with extended neck and 10 position lever handle. (Stem shall be offset from the disc centerline to provide full 360-degree circumferential seating). Sizes 6" and larger furnish gear drive handwheel. Basis of Design: Victaulic MasterSeal™.

2.18 FLOW CONTROL VALVES

- A. Construction: DZR brass (Ametal) or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.
 - 1. Body material shall be ISO 6509 compliant.
- B. Calibration: Control flow within 3.5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control.
- C. Manual (Multiple Turn Balancing Valves): Victaulic Series 786/787/78K circuit balancing valve.
- D. If called for on drawings, furnish Victaulic or Griswold flow control valve. Flow control valve shall automatically control flow rates with $\pm 5\%$ accuracy. Valve control mechanism shall consist of a stainless steel cartridge with a ported cup

and coil/helical spring to avoid corrosion. Four operating ranges shall be available with minimum range requiring less than 2 psig to actuate the mechanism. Manufacturer shall provide independent laboratory tests verifying accuracy and performance. Griswold flow control valve shall have a 5 year warrantee to guarantee all materials and workmanship. See drawings for flow rate of valve.

2.19 SWING CHECK VALVES

- A. Up to and including 3 Inches: Bronze swing disc, solder or screwed ends.
- B. Over 3 Inches: Iron body, stainless steel or bronze trim, swing disc, renewable disc and seat, grooved or flanged ends. Basis of Design: Victaulic Series 712.

2.20 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer, or flanged ends.
- B. Ductile iron body, stainless steel spring and shaft aluminum-bronze disc with elastomer seal or elastomer coated ductile iron disc with welded-in nickel seat, grooved ends. Basis of Design: Victaulic Series 716.

2.21 WATER PRESSURE REDUCING VALVES

- A. Up thru 3 Inches: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, double union ends.
- B. Over 3 Inches: Cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.
- C. Valve shall be as manufactured by Bell and Gossett.

2.22 RELIEF VALVES

- A. Furnish and install as shown on plans a diaphragm-assist operated bronze body ASME rated and nameplated safety relief valve with fail-safe disc to assure normal operation under emergency conditions. The valve shall have a low blowdown differential and shall be designed to relief system pressure in excess of the operating pressure specified for the system, within the maximum operating limitations of the valve. The ASME safety relief valve shall be engineered to prevent the system fluid from entering the spring chamber under normal operating conditions. The permanent valve nameplate shall display the BTUH and relief pressure ratings certified by the National Board of Boiler and Pressure Vessel Inspectors. Valve shall be as manufactured by Bell and Gossett.

2.23 STRAINERS

- A. Size 3 inch and Under: Screwed brass body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

- C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.
- D. Grooved-End Strainers: Size 2 inch through 12 inch, 300 psig working pressure, Y-pattern with 1/16 or 1/8 inch stainless steel perforated screen. Victaulic Series 732.

2.24 INSERTS

- A. Inserts: Malleable iron case of steel shell and expansion plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Unions and flanges for servicing and disconnect are not required in installations using grooved joint couplings. (The couplings shall serve as disconnect points.)

3.3 PLUMBING PIPING INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Dielectric nipples for connection of dissimilar materials. A brass adaptor dielectric union is not acceptable.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
 - 1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.

- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried piping outside the building to ensure not less than 4'-0" of cover for sewers and not less than 5'-6" of cover for domestic water piping.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to weld.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- M. Underground sewers shall be a minimum of 3" in diameter. Sewers located within building shall have a minimum slope of $\frac{1}{4}$ " per foot for piping 3" and smaller and a minimum slope of $\frac{1}{8}$ " per foot for piping 4" and larger.
- N. All junctions of drainage piping shall be made with combination "Y" and $\frac{1}{8}$ bend fittings.
- O. Install bell and spigot pipe with bell end upstream.
- P. Terminate plumbing vents 12" minimum above roof. Furnish and install weather cap on top of all vent pipes.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Solder or "sweat" joints shall be used for all copper and brass fittings, valves and tubing, using the soldering flux and methods recommended by the manufacturer of the tubing and fittings. Solder shall be silver solder for buried piping. No lead solder shall be used on any potable water piping.
- S. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- T. Equipment using gas and related piping shall be installed in compliance with NFPA 54 and 58, as applicable.
- U. Install ductile iron pipe and fittings in accordance with AWWA C600 and manufacturer's instructions.
- V. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
- W. Maintain minimum 10-foot horizontal separation and 18 inch vertical separation of water main from sewer piping or as required by local code.

3.4 PLUMBING PIPING APPLICATION

- A. Use grooved mechanical couplings and fasteners in accessible locations, risers and pipe chases with Architect/Engineer's approval.
 - 1. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).)
- B. Install unions downstream of valves and at equipment or apparatus connections. Unions are not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers. All branch piping take-offs from mains, risers, or branch piping shall have valves installed to allow isolation of branch piping.
- E. Install globe, ball, or butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide plug valves in gas systems for shut-off service. Provide removable or fixed handle for each plug valve.
- H. Provide flow controls in water recirculating systems where indicated.

3.5 INSTALLATION OF INSERTS

- A. Install in accordance with manufacturer's instructions.
- B. Provide inserts for placement in concrete formwork.
- C. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- E. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

- F. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.6 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1½ inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat and finish paint exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed. Hangers and supports located in mechanical spaces are considered exposed.

3.7 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to minimum 1/8 inch per foot for piping 4" and larger, ¼" per foot for piping 3" and smaller. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

3.8 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing. Contractor shall pay all fees, cost, etc. to local authorities for tap-ins, inspections, etc. as required.
- B. Provide new water service complete with reduced pressure backflow preventer, double check valve assembly or water meter with by-pass valves as required by the local authorities.

- C. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
- D. Contractor shall pay all fees, costs, etc. to local authorities for tap-ins, inspections, etc. as required.
- E. Provide new gas service complete with gas meter and regulators. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment. Gas company is responsible for installation of gas service and meter. Contractor shall be responsible for all coordination, etc. Contractor shall inform the gas company of gas load for service for the building and meter size by the gas company. Owner shall pay all gas company charges for gas service directly to the gas company.

3.9 NATURAL GAS PIPING

- A. Natural gas piping located outdoors shall be prime painted and finish painted with rust prohibitor paint that includes zinc. Color shall be selected by the Architect.
- B. Natural gas piping supports shall occur on 8'-0" centers and at changes in direction.
- C. Natural gas piping installed outdoors on the roof shall be supported at a minimum of 3½" above roof level.
- D. Roof supports shall be a manufactured support similar to PHP-SS8 or equal by Miro.

3.10 POLYETHYLENE ENCASEMENT

- A. Encase Ductile Iron piping in polyethylene where indicated on drawings to prevent contact with surrounding backfill material.
- B. Install in accordance with AWWA C105, Method A.
- C. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

3.11 CONCRETE THRUST RESTRAINT

- A. Provide valves, tees, bends, caps, plugs and dead ends with concrete thrust blocks as indicated on drawings.
- B. Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair.
- C. Do not encase fitting joints and flanges.

END OF SECTION

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

MAI: 2021-1551

SECTION 23 05 00 - HVAC REQUIREMENTS

PART 1 GENERAL

1.1 RELATED SPECIFICATIONS AND DOCUMENTS

- A. Drawings and related specifications for this project including General and Supplementary Conditions, Division 1, General Requirements, Instructions to Bidders, Addenda's, etc. apply to and are considered a part of Division 23 - Mechanical Work.
- B. Information in this division is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions, and Division I of these specifications. Any conflict between this Division 23 and other sections or divisions of the specifications or drawings shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor, materials, equipment and incidentals necessary for their complete installation and operation.
- D. All information contained in this section applies to all sections within Division 23 as if it was part of each section.

1.2 DRAWINGS AND SPECIFICATIONS

- A. The drawings and these specifications are intended to supplement each other and any material or labor called for in one shall be furnished even if not specifically mentioned in both. Any material or labor which is neither shown on the drawings nor listed in this specification, but is normally incurred or required for completion of work shall be furnished. If there is a discrepancy between the drawings and specifications, the more stringent of the two shall be followed.
- B. Drawings are diagrammatic and are intended to show approximate location and general arrangement of systems and equipment. No attempt has been made to show every ell, tee, etc. Drawings shall not be scaled for location of systems, equipment, etc. All dimensions whether given on drawings or scaled shall be verified in field and coordinated with all other trades and existing field conditions. Some ductwork, piping, equipment, etc. locations may require changes in location due to field conditions and coordination with other trades will be made with no additional cost to the Owner. Failure to check will be no reason for additional compensation.
- C. These drawings and the associated specifications are intended to provide complete furnishing, installation and operational HVAC systems as specified. If these drawings and associated specifications have information omitted that would not allow a completely operational system as is the intent of the Engineer, the bidder shall notify the Engineer a minimum one week prior to the bid date to allow for addenda. Once bids have been received, the Contractor shall be responsible for material, labor, etc., to furnish and install a completely operational mechanical system as is the intent of these drawings and associated specification.

- D. The installation of all systems, equipment, etc., is subject to clarification with submitted shop drawings and field coordination requirements. Equipment outlines shown on drawings or dimensioned on drawings are limiting dimensions. Any equipment that reduces the indicated clearances or exceeds specified or scheduled equipment dimensions shall not be used.
- E. The Architect/Engineer and Owner reserve the right to make minor changes in the location of equipment, piping, ductwork, etc. at the time of rough-in without additional cost to the Owner.
- F. The Mechanical Trades Contractor shall have completed for his portion of work, at least one installation of size and type comparable to this project and has been in satisfactory operation for at least two complete years. The Mechanical Trades Contractor shall also have a developed service department capable of negotiating service contracts with the Owner for systems herein specified.

1.3 AUTOCAD BACKGROUND FILES

- A. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.4 MANUFACTURER'S SPECIFICATIONS AND CAPACITIES

- A. Some equipment, materials, etc. that are scheduled on the drawings or listed in any addenda may not be specified in this specification. The manufacturer's specification and capacities shall be considered included and part of this specification whether it is specified in this specification or noted or scheduled on the drawings. The contractor shall remove and replace any "substituted" equipment or material that has been installed or is on site, which in the opinion of the Architect/Engineer does not meet the scheduled equipment or materials manufacturer's capacities or specification at no additional cost to the Owner.

1.5 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.6 LOCAL CONDITIONS

- A. Before submitting proposals, each contractor shall examine these specifications and associated drawings, addenda, etc. and shall examine the site of the project. The bidder shall fully investigate the site of this project, investigate coordination of his work with all other trades and existing conditions and completely satisfy himself as to the conditions to which the work is to be performed before submitting his/her bid. No allowances or considerations will be given at a later date for alleged misunderstanding as to the requirements of the work, materials to be furnished, or conditions required by the nature of this project site and coordination by the neglect on the bidder's part to make such an examination and coordination.
- B. Drawings show approximate location of existing services. The mechanical and electrical trades shall check with local utility companies or municipal agencies for exact location of services which they expect to encounter. The Mechanical Trades Contractor shall be responsible for hiring a company such as "Miss Dig" to stake out and locate all utilities in areas of excavation before commencing any work. The Mechanical Trades Contractor shall verify all elevations and locations of existing underground lines which are to be connected into or routed over or under. This verification shall be done prior to beginning work at this project.

1.7 QUALITY ASSURANCE

- A. All work shall be performed in accordance with all local and state codes, laws and regulations applicable to the work for this project. The contractor shall be responsible for all permits and costs for inspections, etc., and for checking with each utility company supplying service to this project and shall determine from them all, any changes in boxes, meters, valves, service, etc., and shall include all cost for inspections, revisions to services, etc. in his bid as required by local agencies, utilities, etc. No extra payment will be made for such items after the contractor submits his bid.
- B. In addition to all applicable Federal, State and local codes, the standards and codes listed below shall apply to all mechanical work. The reference to codes and standards shall be referenced to the latest edition or revision.
 - 1. Air Diffusion Council (ADC)
 - 2. Air Moving and Conditioning Assoc., Inc. (AMCA)
 - 3. American Boiler Manufacturer's Association (ABMA)
 - 4. American Gas Association (AGA)
 - 5. American National Standard Institute (ANSI)
 - 6. American Refrigeration Institute (ARI)
 - 7. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
 - 8. American Society of Mechanical Engineers (ASME)
 - 9. American Society for Testing materials (ASTM)
 - 10. American Welding Society

11. ANSI code of Pressure Piping and Unified Pressure Vessels
12. ASME Boiler and Pressure Vessel Code
13. Institute of Boiler and Radiator Manuf. (IBR)
14. National Electrical Manufacturer's Association (NEMA)
15. Sheet Metal & Air Conditioning Contractors National Association (SMACNA)
16. Standards of the Hydraulic Institute
17. Underwriters' Laboratories (UL)
18. Williams-Steiger Occupational Safety & Health Act (OSHA)

- C. In the event of conflict between drawings, codes, standards or specifications, the most stringent requirement shall apply

1.8 SUBMITTALS AND SHOP DRAWINGS

- A. Submit electronic sets of complete shop drawings for all mechanical equipment and materials associated with Division 23 and associated drawings to the Architect/Engineer for review before fabrication of work or ordering of equipment. Shop drawings shall be submitted at the earliest possible time.
- B. Shop drawings shall be first reviewed by the contractor. Inaccurate shop drawings shall be corrected by the contractor to meet specifications and schedules for this project. The contractor shall then initial the shop drawings as having been reviewed before submitting to the Architect/Engineer. Shop drawings shall have, in addition to the mechanical information, the electrical requirements for minimum circuit amperes and maximum fuse size ratings of the equipment.
- C. Drawings which are rejected must be corrected and returned for Architect/Engineer review before ordering.
- D. Furnish to the job site copies or prints of shop drawings that have been reviewed by the Engineer as soon as possible.
- E. Include a copy of each shop drawing in the Operation and Maintenance Manual.
- F. The checking and reviewing of shop drawings by the Architect/Engineer shall be construed as assisting the contractor and the Architect/Engineer's action does not relieve the contractor from the responsibility for errors or omissions which may exist thereon. The contractor shall be held responsible for errors or omissions that are discovered after approval process and must be made good by the contractor.
- G. The Sheet Metal Contractor, etc. shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer at a minimum \$100.00 for the first file, and \$50.00 for each additional file that may be requested for AutoCAD use.

1.9 PERMITS, INSPECTIONS AND TESTS

- A. The Mechanical Trades Contractor shall take out all permits and arrange for necessary inspections and shall pay all assessments, fees and costs, etc., and make all tests as required by applicable codes. At the completion of the project, the Mechanical Trades Contractor shall furnish certificates of inspection and

approval and secure final occupancy permit. Record copies shall be included in the Operation and Maintenance manuals.

1.10 RECORD DRAWINGS

- A. Maintain an up-to-date set of "record" drawings showing actual equipment, piping, duct, etc. installation locations. Exact dimensions from column lines for all concealed work and tie-ins with elevations noted shall be included.
- B. Include a set of reproducible drawings and a set of prints in each Operation and Maintenance Manual.
- C. The Engineer reserves the right to request and be furnished any additional information he deems necessary to be shown on the record drawings.

1.11 OWNER'S INSTRUCTIONS

- A. Upon completion of the project, the contractor shall be responsible for instructing the Owner's operating staff, in the presence of the Architect/Engineer's representative, in the proper operation and maintenance of the mechanical systems and equipment. Include a statement signed by the Owner that instructions have been given for proper operation and maintenance of the mechanical systems and equipment.

1.12 GUARANTEES

- A. Furnish a written guarantee, to the Architect/Engineer, that will make the contractor responsible at his own expense for any imperfections in material and/or workmanship which may develop under ordinary use within a period of one (1) year from final Owner's acceptance of the work.
- B. Furnish all written guarantees from equipment and/or material manufacturers which shall include the operating and performance conditions and capabilities upon which they are based.
- C. Permanent equipment that is used for temporary heat or cooling shall be guaranteed for one (1) year from the date of final acceptance of the project.

1.13 PORTABLE AND DETACHABLE PARTS

- A. Retain all portable and detachable parts of installation such as keys, spare accessories, operating manuals, etc. include in the Operation and Maintenance Manual.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Furnish to the Architect/Engineer two (2) copies of an approved bound (3 ring binder) book with tabs for sections covering each item of equipment. These notebooks shall include shop drawings, maintenance manuals, operating manuals and parts lists to instruct the Owner on proper operation and use as well as maintenance for each piece of equipment. These books shall also include contractors', subcontractors' and manufacturers' names, telephone numbers and addresses.

- B. Manuals shall also include sequence of operation, control equipment literature, wiring and control diagrams, certificates of guarantees, certificates of inspection, mechanical system test and balancing reports. The contractor shall accumulate and summarize the control and maintenance sequence in a typewritten sheet to be included in the report.
- C. The manuals must be approved by the Architect/Engineer before final payment to the contractor. The Engineer reserves the right to request and be furnished any additional information that he deems necessary to be included in the manuals.

1.15 RESPONSIBILITIES FOR USE OF SUBSTITUTE MATERIALS

- A. Contractor shall notify Architect/Engineer in writing at least ten (10) calendar days before bids are due for approval to use materials and/or equipment other than that which has been specified or scheduled. If substitute materials and/or equipment are approved and used, it will be this contractor's responsibility to guarantee that the items will function as the specified equipment or materials, will in no way alter the design of the structure or system, and will not require any additional mechanical work such as piping, ductwork, etc. Any additional cost required by substitute materials will be the responsibility of the contractor.
- B. It will be the contractor's responsibility, at his own expense, to remove or replace any non-approved equipment or material or any approved equipment or materials not originally specified or scheduled if equipment and materials do not meet with the satisfaction of the Architect/Engineer.
- C. It shall be the Contractor's (Mechanical Trades) responsibility to coordinate and pay for any Electrical Contractor costs due to any changes in substitute materials and/or equipment's power requirements, which differ from that shown on the design documents.
- D. No consideration will be given to requests for substitute materials because of delivery problems unless the contractor can prove that orders were placed as soon as possible after contract was awarded and that delays were not caused by submittal of unscheduled or unspecified (substituted) materials to the Architect/Engineer.

1.16 COST BREAKDOWN AND EQUIPMENT LIST

- A. The successful bidder shall be responsible for submitting a cost breakdown to the Architect/Engineer and Owner within ten (10) calendar days after date of request of the breakdown. During progress of the work, if changes occur which cause additional cost, the price on such items shall be broken down in accordance with the items listed in the breakdown.
- B. The bidders shall be responsible for submitting a complete list of all equipment manufacturers, makes, models, etc. that will be used for this project with their proposal. The equipment list shall be typed on the contractor's letterhead and shall be signed by the authorized officer.

1.17 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this project shall have a minimum warrantee of one (1) year. All materials and equipment shall be new, of first class quality and shall be furnished, delivered, erected, installed and finished in every detail and shall be so selected and arranged as to fit into the building space. All material or equipment that is not specified but necessary for this project shall be subject to the approval of the Architect/Engineer.
- B. Any materials or equipment not specified or scheduled but similar to that which has had prior approval shall be listed as a substitution and noted on the proposal form as such.
- C. The contractor shall include all miscellaneous materials and labor required to completely install and operate the mechanical systems as is intended by these drawings and specification.

1.18 TEMPORARY HEATING OR COOLING OF SPACE/BUILDING DURING CONSTRUCTION

- A. It is not recommended to use HVAC equipment being furnished for the project for temporary heating and cooling of the space/building during construction. If it is necessary to utilize the HVAC equipment for tempering air, filters shall be placed at face of each return diffuser or grille. Mechanical Contractor shall be responsible for removing temporary; filters at each return diffuser, cleaning return air ductwork and installing new filters within the HVAC equipment before space/building is turned over to the Owner.

1.19 SCHEDULE, COORDINATION AND INSTALLATION OF WORK

- A. The contractor shall carry on work in such a manner as to meet the dates as scheduled by the General Contractor and shall work overtime at no expense to the Owner as required to comply with the schedule. This contractor shall schedule all work with Owner and Architect/Engineer and schedule shut down of systems with Owner.
- B. Examine the site and all drawings and specifications and coordinate work with all other trades before commencing work for this project. Arrange work essentially as shown with the exact layout to be made on the job to suit actual conditions. Precise locations of equipment and materials shall be coordinated and shall be the responsibility of this contractor. Should any conflicts in location occur, and necessary deviations from drawings are required as determined by the Architect/Engineer, the contractor shall make necessary adjustments without additional cost to the Owner. Any damage to HVAC equipment due to HVAC equipment operation during construction shall be paid for by the Mechanical Contractor.
- C. All equipment, piping, ductwork, etc. shall be located and/or routed to allow for the most convenient access for servicing.
- D. Arrange for necessary access doors, panels, etc. to allow servicing of equipment, piping, valves, fire dampers, etc. Perform any cutting and patching as required, made necessary by failure to make proper arrangements.
- E. Indicated equipment connections, sizes and locations shall be verified and connected according to manufacturer's shop drawings and installation instruc

tions. Thoroughly investigate the space provided for equipment and connections before ordering equipment. All equipment shall be selected to fit into the space allowed, including connections with adequate space allowed for operation and maintenance.

- F. All work shall be installed in a neat and workmanlike manner, using skilled personnel thoroughly qualified in the trade or duties that they are to perform. Rough work will be rejected.
- G. Coordinate all equipment deliveries and schedules to allow timely installation. Contractor shall separate equipment into sections and reassemble in building if required by the installation at no extra cost to the Owner.
- H. Furnish a superintendent approved by the Architect/Engineer to oversee and coordinate the work to be performed with all other trades.
- I. Coordinate location of pipes, ductwork, etc. with other building components such as structural components (beams, joists, columns, etc.), electrical components (lighting, conduits, etc.) and architectural components (walls, ceilings, floors, pipe chases, roof, etc.).
- J. Before starting work, Contractor shall verify that available space for proposed pipes, ducts, equipment etc. is adequate for the intended purpose and will result in a first class installation. Irregardless of drawings, responsibility for first class operating systems rests with the Contractor.
- K. Arrange for chases, slots, openings, etc. and other building components to allow for mechanical systems installation. Coordinate cutting and patching of these components to accommodate installation. This contractor shall be responsible for accurately locating for the general trades all chases, shafts, etc. and shall be responsible for all cutting and patching if these chases were not accurate or not coordinated in time with the general trades. Coordinate installation of all sleeves in walls, on floors or other structural or architectural components.
- L. Sequence, coordinate and integrate installation of equipment and materials for efficient work flow during the project. Particular attention should be spent on larger pieces of equipment.
- M. Install equipment and materials with provisions for necessary access for service and maintenance. Allow space for removal of all parts that may require replacement or servicing.
- N. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- O. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. When access panels are required, valves and equipment components requiring access shall be located to minimize the number of panels.
- P. Examine the work as it progresses and alert the Architect/Engineer in writing of any instances or obstructions that will prevent this contractor from performing his/her work.

1.20 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.21 COOPERATION WITH ARCHITECT/ENGINEER AND OTHERS

- A. Coordinate all aspects of the mechanical system installation with all other trades, existing conditions, etc.
- B. If the bidder believes that changes in design are required to meet intended design capacities and operation or material and/or equipment is obviously omitted from these specifications and drawings, the bidder shall contact the Architect/Engineer in writing at least ten (10) days before bid date. The acceptance of a bid by the Owner shall be binding and shall indicate that the bidder does not require any changes in design nor additional costs in order to meet the design and performance of the mechanical system as indicated in these specifications and drawings.

1.22 WORK INVOLVING OTHER TRADES

- A. Equipment or materials specified in Division 23 may have to be installed by other trades (such as electrical trades or architectural trades) due to code requirements or union jurisdictional requirements. Where this occurs, this contractor shall include all costs required by other trades to complete the work and hire the respective trade to perform this work.

1.23 PERFORMANCE DATA AND ACCESSIBILITY

- A. All performance data specified in this specification or scheduled on drawings shall be considered actual performance of the equipment after installation. The supplier and installer shall be responsible for suitable allowances to adjust equipment to design capacities when actual operating and installation conditions differ from drawings.
- B. All equipment and materials shall be installed to allow access for servicing and maintenance. Coordinate final location of such equipment and materials that are concealed with required access doors on panels. Allow ample space for replacement or servicing. Extend all grease fittings to an accessible location.

1.24 CUTTING AND PATCHING

- A. Unless noted otherwise, the Mechanical Trades shall be responsible for all cutting, patching and associated work required under Division 23. This work shall be performed by trades normally performing this type of work except drilling of

holes shall be done by the contractor requiring same. This includes replacing areas of cutting required by this work with proper reinforcing, termite shielding, materials, finishing, etc. to restore the areas to their original condition, and filling all openings around ducts, piping, etc. with approved fire retardant materials. Regardless, all drilling of holes shall be the responsibility of the Contractor requiring same.

- B. If noted on drawings that the General Trades will be responsible for all cutting and patching, it will be the Mechanical Trades responsibility to notify all General Trades during bidding of all areas requiring cutting and patching. Regardless, all drilling of holes shall be the responsibility of the contractor requiring same.

1.25 WORK IN EXISTING BUILDINGS

- A. Coordinate and schedule all work in existing building with Owner and Architect/Engineer. Systems shall be kept in operation at all times if at all possible. If a system shut-down is required, the contractor shall schedule with the Owner, the time and length of shut-down. A system shall not be shut down without written permission from the Owner.
- B. All existing equipment, piping, ductwork, etc. that is to be removed shall remain the property of the Owner. The contractor shall remove and locate this material that remains the property of the Owner to a location determined by the Owner somewhere on site. If the Owner does not want to maintain possession of the removed material, the contractor shall be responsible for removing material from the site and disposing of this material as necessary to meet all codes and requirements and shall pay all costs as required for any disposal fees, inspections, permits, etc.
- C. All existing piping, equipment, etc. whether shown on drawings or not that is to be removed and/or abandoned and does not remain property of the Owner shall be removed from site.
- D. Any existing piping, valves, mechanical equipment, etc. serving the existing building which are shown or not shown on drawings and are required for systems operation shall remain in use. If these systems require relocation to allow installation of new systems, the contractor shall be responsible for relocating to an Owner and Architect/Engineer approved location. The contractor shall pay all cost for this work and include such cost in his/her bid. (As specified previously, contractor shall be responsible for examining site and include all cost for work required to complete this project.)
- E. When active services, etc. are encountered in this project, the contractor shall furnish and install bracing, support, etc. as required to protect and keep these services active. (As specified previously, these drawings are diagrammatical. The contractor shall be responsible for verification of all existing services, piping, equipment, etc.).

1.26 ACCESS TO EQUIPMENT, HEATING COILS, VALVES, ETC.

- A. Coordinate access panels with type of construction and furnish access panels in areas that are non-accessible. Access panels shall be furnished by this contractor and installed by the General Contractor. The access panels shall be all approved,

UL labeled and fired rated and shall be located and sized to allow access to equipment, heating coils, valves, fire dampers, etc.

- B. Where access panels are required, valves, equipment etc. shall be located as to require the least number of access panels.

1.27 EQUIPMENT GUARDS

- A. All rotating or moving parts of equipment that are located so as to be a hazard shall be fully enclosed or properly guarded as to meet or exceed all regulations and OSHA requirements.

1.28 EQUIPMENT CONNECTIONS

- A. Connections to equipment, plumbing fixtures, etc. shall be made in accordance with shop drawings, rough-in dimensions furnished by the manufacturer, codes, etc. and may vary with connections shown on drawings. The contractor shall be responsible for making connections and number of connectors as per shop drawings, codes, etc. at no additional cost to the Owner.

1.29 ELECTRICAL CONNECTIONS

- A. The Electrical Trades shall be responsible for furnishing and installing all electrical equipment, wiring, etc. required for operation of mechanical equipment unless otherwise noted on the drawings. The Mechanical Trades shall furnish detailed information and wiring diagrams to the Electrical Trades for all equipment specified and/or scheduled for this project. In the event that the Mechanical Trades furnishes an "approved equal" or "alternate" that require changes in the original electrical design, the Mechanical Trades shall pay all costs to the Electrical Trades as required to make satisfactory adjustments. All electrical work shall be done in accordance with the latest edition of the National Electric Code.
- B. See the temperature control or building automation system specification (if applicable) for description of electrical contractor work and Division 23 temperature control work.

1.30 MOTORS, MOTOR STARTERS AND DISCONNECTS

- A. Unless otherwise noted on drawings, motors shall be of constant speed 1750 rpm, new NEMA Design B, 40°C rise, horse power rated, open drip-proof except TEFC in dirty atmosphere, induction type motor with service factor of 1.15 and be of sufficient capacity to continuously operate the apparatus to which it is connected under all conditions of operation without exceeding nameplate ratings.
- B. Motors shall be premium efficiency as calculated using IEEE test method 112B.
- C. Motors ½ Hp. or larger shall be three phase; motors under ½ Hp. shall be 115 volt, 60 cycle, single phase. Before ordering the motors, the contractor shall verify correct motor voltage with the Electrical Trades and field conditions.
- D. The Mechanical Trades shall furnish, for equipment under Division 23, all special switches, disconnects, starters, alternators, etc. as specified or scheduled to be

factory furnished and/or factory installed with the equipment including wiring diagrams, etc. whether it is to be factory installed or field wired. All other motor starters, disconnects, etc. not noted as factory furnished shall be furnished and installed by the Electrical Trades.

- E. Starters that are to be factory furnished with equipment shall be of the combination type and shall be as specified under Electrical Trades Division. Furnish overload protection for each phase.
- F. All wiring methods and materials shall meet NEMA, National Electric Code and State of Michigan Code requirements.
- G. All displays on control panels shall be on face of the panels.
- H. Motors having V-belt shall be furnished with base slide rails or other form of adjustment.

1.31 LUBRICATION AND MAINTENANCE

- A. Contractor shall maintain, oil, lubricate, etc. all equipment furnished under Division 23 until final acceptance by the Owner. Protect all bearings and shafts during installation and thoroughly grease the steel shafts to prevent corrosion. The contractor shall be responsible for any and all damage to bearings, shaft, etc. of Division 23 equipment operated or not until final acceptance by the Owner.

1.32 EXCAVATION AND BACKFILLING

- A. Furnish all excavation, backfilling and removal of excess dirt to accomplish installation of Division 23 mechanical work unless otherwise noted on drawings.
- B. All excavation shall be by open cut from the surface. Contractor shall determine whether excavation shall be by machine or by hand except where existing utilities may be located where excavation shall be by hand. Contractor shall be responsible for all damage to existing facilities and services. Excavation shall be to a depth of at least 6" to allow granular bedding below pipe or duct.
- C. If for any reason the work is suspended, the contractor shall properly protect the excavation and leave the areas unobstructed.
- D. Trench width shall allow sufficient width at centerline of pipe to allow at all times a first class construction/installation method but in no case should be less than 12" larger than the nominal pipe or duct size. This shall especially be true in areas that joints must be connected. Joint holes may have to be made with overhanging sides to make installation safe for workmen.
- E. The excavation shall be at all times finished and backfilled to the required grade after completion and approval of work. Not more than 100 feet of trench shall be excavated and open unless written approval is given by the Architect/Engineer.
- F. The subgrade shall be 4" to 6" below the pipe of granular bedding graded and tamped by hand or mechanical means to the exact elevation required at the bottom of the pipe. Granular materials shall be approved fine aggregate meeting MDOT #2NS specifications. This material shall pass a ½" sieve but will be retained on a #4 sieve. If poor soil conditions exist which will not give proper support to

the pipe, duct or structure, furnish granular fill as required to remedy this situation and give proper support.

- G. Furnish and install properly sloped sheet piling, shored and braced in areas that the soil requires this to maintain a proper excavation and prevent any movement of earth which could in any way damage the work under construction. When removing the sheeting and bracing, special care should be taken to prevent any caving of the sides of the excavation and injury to the completed work or adjacent property.
- H. Take all necessary action to keep trenches and other excavation areas free from water at all times. Use such methods as pumping, ditching, well pointing, etc. to prevent water in trench or excavation. Dewatering of trench shall have constant supervision.
- I. Backfill excavation and trenches with approved granular material around sides of pipe and at least 12 inches above the top of the pipe laid not more than in 6 inch layers that are thoroughly tamped to 95% of its maximum density. There shall be no backfilling by any mechanical means until the granular material has been firmly tamped around the entire pipe to 12 inches above the pipe. All material used for backfilling shall be approved by the Architect/Engineer. Wherever trenching crosses walks or roadways or isolated inside of building, backfill top 6'-0" of trench with sand or bank run gravel in layers not to exceed 6 inches in depth and carefully compact by hand or machine. Do not backfill with frozen materials.
- J. No piping shall be covered until it has been tested, inspected and approved. Upon completion of backfilling, grade shall be restored in indicated elevation and left in reasonable condition for finish grade by others unless otherwise noted on drawings.
- K. Before final acceptance of work, all disturbed streets, drives, curbs, walks, parking areas, etc. shall be paved, graveled or other to as near their original condition as possible. All unused excavated material shall be removed from site if directed by the Architect/Engineer.

1.33 BASES AND SUPPORTS

- A. This contractor shall be responsible for furnishing all equipment pads and supports for equipment and materials required by Division 23 unless otherwise noted on drawings.
- B. All floor mounted mechanical equipment shall have a reinforced concrete pad furnished unless otherwise noted on drawings. The concrete pads shall be tied to the building floor with expansion bolts located maximum of 4'-0" on centers with a minimum of four (4) bolts, set before pouring and concealed within the pad. The Mechanical Trades shall verify exact pad or support size with the equipment manufacturer and shall size pad with adequate area to allow sufficient room for installation of vibration isolators, equipment mounting hardware, etc. Concrete pads shall have a 45 degree bevel at the top edge. The contractor shall verify exact location of concrete pads.

- C. Furnish all steel, hanging material, rods, etc. for suspending equipment off floor unless otherwise noted on drawings for equipment to be furnished under Division 23. This includes all structural steel for supporting between beams.
- D. All support structure shall be of strength to safely withstand all stresses and loads to which they will be subjected and shall distribute load properly over the building area. Supports shall be designed to avoid undue strain to equipment and to avoid interference with piping, pipe connections, service and maintenance clearances, etc.
- E. Where equipment is to be floor mounted and requires legs, this contractor shall furnish and install structural steel members or steel pipe and fittings for legs. Fasten and brace to equipment and furnish flange at base to allow bolting to floor.
- F. Where equipment is to be ceiling or wall mounted, furnish necessary platform, structural steel, hardware, etc. as is most suitable for support of this equipment.
- G. All supports shall be approved by the Architect/Engineer.
- H. All piping, ductwork, etc. shall be suspended from structural steel members utilizing rods and approved hanger devices. Do not use metal deck for support. Beam clamps such as the Grinnell Fig. 260 or approved equal shall be used. Sheet metal "straps" shall not be used in place of rods.
- I. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

1.34 SLEEVES, PLATES AND COLLARS

- A. Furnish all sleeves, plates and collars for piping, ductwork, etc. passing through walls, floor ceilings, foundations, etc. Coordinate with the General Contractor the exact location and size of required openings. No pipe or duct shall pass through a wall, floor ceiling, etc. without a sleeve. This contractor shall be responsible for sleeve locations and securing sleeves before concrete is formed.
- B. Sleeves for steel pipe shall be standard weight black steel pipe. For walls, foundations and ceilings, sleeve shall be kept flush with finished surfaces. For floors, the sleeve shall be set flush with bottom of concrete construction and be extended up ¼" above concrete floor. Sleeves shall be set in place before construction of walls, floors, ceilings, etc.

- C. Sleeves for copper pipe shall be type "M" hard copper tubing installed typical to that of steel pipe sleeves.
- D. Sleeves for piping shall be sized to allow insulation to run continuous through sleeve whenever possible and to allow not less than ¼" all around bare pipe or insulation.
- E. Sleeves for ducts passing through floors shall be 14 gauge black steel for ducts up to 24" maximum dimension, and 12 gauge black steel for ducts 25" and over maximum dimension. Sleeves shall be kept flush with the finished wall surface.
- F. Where insulated piping passes through walls or floor sleeves, furnish 22 gauge galvanized band around insulation of same length as the sleeve length. Band shall fit snugly over insulation and be held in place by steel metal collars all around insulation to cover openings.
- G. All penetration voids shall be sealed smoke tight with non-combustible materials similar to 3M or Hilti firestop systems to maintain the integrity of the fire rated structure. In a non-fire rated assembly, seal all voids with non-hardening sealant.
- H. Where bare piping 2" and smaller pass through wall or floors, furnish polished chrome plated brass escutcheons, split type. Bare piping 2½" and larger that pass through walls or floor, furnish 22 gauge galvanized steel metal collars so as to cover opening.
- I. Where piping penetrates an outside wall, below grade, utilize a mechanical sleeve, similar to link-seal, with stainless steel nuts and bolts on fasteners.

1.35 RIGGING AND HOISTING

- A. Perform all required rigging, hoisting, transportation, moving, etc. of all equipment, materials, etc. to be furnished and/or installed under Division 23 whether furnished by this contractor or by the Owner or other trades.

1.36 STORAGE FACILITY

- A. Furnish and maintain a weatherproof storage facility on the site of adequate size to store miscellaneous equipment and/or materials to prevent exposure to the weather. Location of shed shall be determined by the Owner and Architect/Engineer. The Owner reserves the right to deny storage of materials or equipment in any existing or new buildings.

1.37 PROTECTION FROM DAMAGE

- A. The contractor shall be responsible for all materials, equipment, etc. and all work installed by himself and shall protect it from damage until final acceptance of this project by the Owner.
- B. Furnish all coverings and protection from dirt, dust, rain, storm, heat, traffic, wear, etc. and all possible injury including that by other workmen. Any equipment, workmanship, materials, etc. damaged prior to final acceptance by the Owner of this project shall be properly repaired at no expense to the Owner.

- C. Protect all plumbing fixtures and other equipment from damage by covering or coating. Any dented, scratched, rusted or marred surface finishes will not be accepted.
- D. Protect all equipment, materials, etc. from freezing.

1.38 COMMON PIPE MATERIALS AND INSTALLATION INSTRUCTIONS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
- C. Refer to individual Division 23 piping Sections for special joining materials not listed below.
 - 1. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - a. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
 - 1) Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - 2) Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 3. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
 - 4. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
 - 5. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
 - 6. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
 - 7. Solvent Cements for Joining Plastic Piping:
 - a. ABS Piping: ASTM D 2235.
 - b. CPVC Piping: ASTM F 493.
 - c. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - d. PVC to ABS Piping Transition: ASTM D 3138.
 - 8. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

1.39 PIPE HANGERS AND SUPPORTS

- A. Hangers and saddles shall be Modern Pipe Support Corp., Grinnel/Anvil, Autogrip, or M-CO. Inserts shall be of the type to receive a machine bolt head or nut after installation, permit horizontal adjustment, and shall be flush with the surface. For copper pipe with steel hangers, clean and wrap pipe with two layers of plastic insulating tape at point of contact. Roller supports shall be adjustable type with insulated standoff. Rods shall be used for suspended installation. Sheet metal "straps" shall not be used in place of rods.

- B. Hangers for piping with vapor barrier sealed insulation shall be multipurpose pipe saddles fitting over the insulation. Wire or perforated strap iron will not be permitted for pipe supports. Do not support hangers from roof deck. Furnish and install all support steel as required to suspend from structural steel joist or beams. Hangers shall be clevis or split ring type with vertical adjustment and beam clamp similar to Grinnell/Anvil Fig. 260, with maximum spacing per ASHRAE Standards:

Pipe Size	Steel Pipe	Copper Pipe	PVC Pipe	Rod Size
½ to ¾ inch	6 feet	5 feet	4 feet	3/8"
1 inch	7 feet	5 feet	4 feet	3/8"
1 ¼ inch	7 feet	7 feet	4 feet	3/8"
1½ inch	7 feet	7 feet	4 feet	1/2"
2 inch	10 feet	8 feet	4 feet	1/2"
2½ inch	11 feet	9 feet	4 feet	5/8"
3 inch	11 feet	9 feet	4 feet	5/8"
3 ½ inch	13 feet	11 feet	4 feet	5/8"
4 inch	14 feet	12 feet	4 feet	3/4"
5 inch	14 feet	12 feet	4 feet	3/4"
6 inch	14 feet	--	4 feet	3/4"
8 inch	16 feet	--	4 feet	7/8"
10 inch	16 feet	--	4 feet	7/8"
12 inch	20 feet	--	4 feet	1"
14 inch	20 feet	--	4 feet	1¼"
16 inch	20 feet	--	4 feet	1¼"
18 inch	20 feet	--	4 feet	1¼"

- C. Conform to ASME B31.9, ASTM F708, MSS SP58, MSS SP69 and MSS SP89.
- D. Hangers for Hot Pipe Sizes ½ to 1½ Inch: Malleable iron, adjustable swivel, split ring.
- E. Hangers for Cold Pipes sizes ½" to 1½" and Hot and Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- F. Hangers for Hot Pipe Sizes thru 4 Inches: Carbon steel, adjustable, clevis.
- G. Hangers for Hot Pipe Sizes 5 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
- H. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- I. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
- J. Wall Support for Pipe Sizes up thru 3 Inches: Cast iron hook.
- K. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

- L. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- M. Vertical Support: Steel riser unistrut clamps at high, mid, and low locations.
- N. Floor Support for Cold Pipe all sizes and Hot Pipe Sizes up thru 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- O. Floor Support for Hot Pipe Sizes 5 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- P. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- Q. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- R. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustments, top slot for reinforcing rods, lugs for attaching to forms, size inserts to suit threaded hanger rods.

1.40 PIPING, DUCTWORK AND EQUIPMENT SUPPORT

- A. Attachments of mechanical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points. When routing piping or ductwork perpendicular to joist, a support shall be provided at every steel joist; when parallel to joist, a support shall be provided at no more than 6' on centers or two panel bays. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Mechanical Trades may contact the project Structural Engineer as required for panel point location assistance and welder certification requirements. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Mechanical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

1.41 PIPING SYSTEMS SHUT OFF VALVES

- A. Shut off valves shall be installed at all branch lines off main piping, or where mains divide/separate to serve different areas, to allow isolation of all branch piping and systems they serve such as air handling units, areas or wings of the building, etc.

1.42 CLEANING AND FINISHING

- A. During construction period, remove all debris, rubbish, tools, equipment, unused materials, etc. as required or requested by the Architect/Engineer. All cost for cleanup and removal will be the responsibility of the contractor.
- B. Upon completion of the project and before final acceptance by the Owner, the entire installation shall be thoroughly cleaned, all rubbish and unused material removed to the satisfaction of the Architect/Engineer. All dust and dirt shall be removed from all equipment, piping, ductwork, etc.
- C. Thoroughly clean all heating units, fans and fan wheels, diffusers and grilles, air handler plenums and air filter frames, etc. using compressed air if necessary.
- D. Finish paint all equipment, materials, piping, etc. as noted on drawings or listed in this specification. Match Owner's existing color scheme. Any Division 23 equipment which has been scratched or damaged shall be finished equal to the original finish.

1.43 DUCTWORK MANUAL BALANCING DAMPERS

- A. All duct branch take off's to diffusers, grilles, regulators, etc. shall have manual balancing dampers installed to allow balancing of outlets.

1.44 EQUIPMENT/SYSTEMS START-UP

- A. Furnish and schedule manufacturer's start-up service for all equipment and systems. These start-up services shall be performed in the presence of, and to the satisfaction of the Owner and Architect/Engineer.

1.45 EQUIPMENT/SYSTEMS SIGN-OFF

- A. The Mechanical Trades shall furnish written sign-offs on all systems stating that the equipment and systems have been checked, tested, started and that their operation has been verified correct through the entire range of operation that can be expected through the seasons.

1.46 SUBSTANTIAL COMPLETION

- A. Contractor shall submit a letter to the Architect/Engineer advising that all work has been completed in accordance with plans and specifications and the project is ready for a final walk-thru.

END OF SECTION

MAI: 2021-1551

SECTION 23 05 53 - HVAC IDENTIFICATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Medical Gas Systems: Supply of pipe labels for placement by this Section.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ANSI or equal standards for the Identification of Piping Systems.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color. Furnish and install on all mechanical equipment.

2.2 TAGS

- A. Metal Tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.
- B. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. ¾ to 1¼ inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ½ inch high letters.
 - 2. 1½ to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, ¾ inch high letters.
 - 3. 2½ to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1¼ inch high letters.
 - 4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2½ inch high letters.
 - 5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3½ inch high letters.
 - 6. Ductwork and Equipment: 2½ inch high letters.

- B. Stencil Paint shall be semi-gloss enamel, colors conforming to ASME A13.1.

2.4 PIPE MARKERS

- A. Color: Match existing or conform to ANSI/OSHA standards.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

- A. Description: Steel with $\frac{3}{4}$ inch diameter color coded head.
- B. Color code as follows:
 - 1. Yellow - HVAC equipment
 - 2. Red - Fire dampers/smoke dampers
 - 3. Green - Plumbing valves
 - 4. Blue - Heating/cooling valves

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces as required by manufacturer's installations for stencil painting.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Identify each piece of equipment with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats relating to terminal boxes or valves with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Identify piping, concealed or exposed, with plastic tape pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- L. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- M. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.
- N. Identify access points at the exterior of all fire, smoke, or combination fire/smoke dampers with a permanent label, having letters not less than ½" in height, reading fire damper, smoke damper or fire/smoke damper respectively.

END OF SECTION

MAI: 2021-1551

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS AND DRAWINGS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. AABC - National Standards for Total System Balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

- A. Submit electronic draft copies of report for review prior to final acceptance of Project. Provide electronic final copies for Architect/Engineer review and for inclusion in operating and maintenance manuals.
- B. Provide reports in 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. Binder shall be high quality hard cover type.
- C. Include detailed procedures, agenda, sample report forms and copy of NEBB Project Performance Guaranty prior to commencing system balance.

- D. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or forms approved in writing by Architect/Engineer.

1.5 PROJECT RECORD DOCUMENTS

- A. Record actual locations of flow measuring stations and/or balancing valves and rough setting.

1.6 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. Maintain one copy of each document on site.
- C. The final air balance report shall be approved by the Architect/Engineer prior to final payment to the Contractor. The Engineer reserves the right to ask for and be furnished any additional information he deems necessary to be shown on air/water balance report.

1.7 QUALIFICATIONS

- A. Agency: Independent company (not associated with the systems installing contractor) specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years experience and NEBB certified. The test and balance agency selected by the Contractor shall be approved by the Engineer. The Mechanical Trades shall be responsible for any cost differences between the test and balance agency selected by the Contractor and the test and balance agency approved by the Engineer.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project. Coordinate project schedule with contractor. The Mechanical Trades shall coordinate and schedule the on-site balancing with the Engineer to allow the Engineer the ability to be at the project site during the time of the balancing. If the Engineer is not scheduled to oversee the balance of systems, the Mechanical Trades shall be responsible for rebalancing the system in the presence of the Engineer and be responsible for all costs for such.
- B. The Test and Balance Agency shall schedule/coordinate (through the Mechanical Contractor) with the Temperature Control Contractor. The Temperature Control Contractor should be on site during the air balance to verify proper operation of the system required for the air balance.
- C. Acceptable Test and Balance Contractors.
 - 1. HiTech Test and Balance (Freeland, MI)
 - 2. Absolute Balance Company (South Lyon, MI)
 - 3. Enviro-Aire/Total Balance Company (St Clair Shores, MI)
 - 4. Ener-Tech Testing (Holly, MI)
 - 5. International Test & Balance (Southfield, MI)

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Hydronic systems are flushed, filled, and vented.
 - 13. Pumps are rotating correctly.
 - 14. Proper strainer baskets are clean and in place.
 - 15. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

- A. Provide a review of proposed design drawings and advise appropriate trades about additional balancing devices required to attain design conditions.
- B. Advise Engineer about additional balancing devices required to attain design conditions.
- C. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply, return and exhaust systems.
- B. Air Outlets and Inlets: Adjust to within plus 10 percent and minus 5 percent of design and to Owner's satisfaction. Respond to Owner complaints of unsatisfactory room temperatures by adjusting outlets and/or inlets to more or less air as required.

- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities. The air balance agency shall be responsible for removing all adjustable motor pulleys and replacing them with fixed motor pulleys after air balancing the system. Include costs for all air systems to be readjusted to required air volumes. Pitot duct mains at supply air and return air ducts at air handling systems and exhaust fans to verify air quantity at units vs. at diffusers and grilles.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices at outlets to regulate air quantities so that outlets do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- M. Check units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- N. For variable air volume units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- O. On VAV boxes, adjust for proper operation.
- P. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.
- Q. Adjust adjustable pitch sheaves to setting as required by actual conditions. If sheave size or type changes are recommended, include the recommendation in the draft copy of the report to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balanced point.

- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.
- G. Advise Mechanical Contractor about additional balancing devices required to attain design conditions.
- H. If pump impellor trimming or size change is recommended to improve reliability or reduce operating cost, include the recommendation in the draft copy of the report, to allow the Owner to be informed of, and be responsible for, the recommendation for the change.

3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing shall include but not be limited to: Air moving equipment such as exhaust fans, air handlers, return fans, etc.; terminal devices such as grilles and diffusers, variable air volume boxes, etc.; all hydronic systems such as pumps, chillers, flow control valves, coils, etc. See drawings for equipment utilized for this project and submit applicable report forms for this project air and/or water system(s).
- B. Report Forms
 - 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone number of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
 - 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
 - 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
 - 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP
 - d. Phase, voltage, amperage; nameplate, actual, no load

- e. RPM
- f. Service factor
- g. Starter size, rating, heater elements
- h. Sheave Make/Size/Bore
- 5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual
- 6. Pump Data:
 - a. Identification/number
 - b. Manufacturer
 - c. Size/model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP
 - g. Actual flow rate, pressure drop, BHP
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - l. Shut off, total head pressure
 - m. Heat output
- 7. Air Cooled Condenser:
 - a. Identification/number
 - b. Location
 - c. Manufacturer
 - d. Model number
 - e. Serial number
 - f. Entering DB air temperature, design and actual
 - g. Leaving DB air temperature, design and actual
 - h. Number of compressors
- 8. Cooling Coil Data:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Entering air DB temperature, design and actual
 - g. Entering air WB temperature, design and actual
 - h. Leaving air DB temperature, design and actual
 - i. Leaving air WB temperature, design and actual
 - j. Water flow, design and actual
 - k. Water pressure drop, design and actual
 - l. Entering water temperature, design and actual
 - m. Leaving water temperature, design and actual
 - n. Saturated suction temperature, design and actual
 - o. Air pressure drop, design and actual
- 9. Heating Coil Data:
 - a. Identification/number
 - b. Location

- c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Water flow, design and actual
 - g. Water pressure drop, design and actual
 - h. Entering water temperature, design and actual
 - i. Leaving water temperature, design and actual
 - j. Entering air temperature, design and actual
 - k. Leaving air temperature, design and actual
 - l. Air pressure drop, design and actual
10. Cooling Tower:
- a. Tower identification/number
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Rated capacity
 - f. Entering air WB temperature, specified and actual
 - g. Leaving air WB temperature, specified and actual
 - h. Ambient air DB temperature
 - i. Condenser water entering temperature
 - j. Condenser water leaving temperature
 - k. Condenser water flow rate
 - l. Fan RPM
11. Heat Exchanger:
- a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Steam pressure, design and actual
 - h. Primary water entering temperature, design and actual
 - i. Primary water leaving temperature, design and actual
 - j. Primary water pressure drop, design and actual
 - k. Secondary water leaving temperature, design and actual
 - l. Secondary water flow, design and actual
 - m. Secondary water pressure drop, design and actual
12. Electric Duct Heater:
- a. Manufacturer
 - b. Identification/number
 - c. Location
 - d. Model number
 - e. Design kW
 - f. Number of stages
 - g. Phase, voltage, amperage
 - h. Test voltage (each phase)
 - i. Test amperage (each phase)
 - j. Air flow, specified and actual
 - k. Temperature rise, specified and actual
13. Air Moving Equipment:
- a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge

- f. Air flow, specified and actual per pitot readings at equipment and per totaled outlets.
 - g. Return air flow, specified and actual per pitot readings at equipment and per totaled inlets.
 - h. Outside air flow, specified and actual per pitot.
 - i. External and total static pressure, specified and actual
 - j. Inlet pressure
 - k. Discharge pressure
 - l. Sheave Make/Size/Bore
 - m. Number of Belts/Make/Size
 - n. Fan RPM
- 14. Return Air/Outside Air Data:
 - a. Identification/location
 - b. Design return air flow
 - c. Actual return air flow per pitot readings at equipment and per totaled grilles air flow measurement
 - d. Design outside air flow
 - e. Actual outside air flow per pitot readings
 - f. Return air temperature
 - g. Outside air temperature
 - h. Required mixed air temperature
 - i. Actual mixed air temperature
 - j. Design outside/return air ratio
 - k. Actual outside/return air ratio
- 15. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual per pitot readings at exhaust fan and per totaled exhaust grilles or duct inlets.
 - f. Static pressure, specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM
- 16. Duct Traverse:
 - a. System zone/branch and at all equipment (AHUs, RTUs, EFs, etc.)
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity
 - g. Test air flow
 - h. Duct static pressure
 - i. Air temperature
 - j. Air correction factor
- 17. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor

- f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
- 18. Air Monitoring Station Data:
 - a. Identification/location
 - b. System
 - c. Size
 - d. Area
 - e. Design velocity
 - f. Design air flow
 - g. Test velocity
 - h. Test air flow
- 19. Flow Measuring Station:
 - a. Identification/number
 - b. Location
 - c. Size
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Design Flow rate
 - h. Design pressure drop
 - i. Actual/final pressure drop
 - j. Actual/final flow rate
 - k. Station calibrated setting
- 20. Terminal Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
- 21. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor
 - f. Design velocity
 - g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - j. Percent of design air flow
- 22. Sound Level Report:
 - a. Location

- b. Octave bands-equipment off
- c. Octave bands-equipment on
- 23. Vibration Test:
 - a. Location of points:
 - 1) Fan bearing, drive end
 - 2) Fan bearing, opposite end
 - 3) Motor bearing, center (if applicable)
 - 4) Motor bearing, drive end
 - 5) Motor bearing, opposite end
 - 6) Casing (bottom or top)
 - 7) Casing (side)
 - 8) Duct after flexible connection (discharge)
 - 9) Duct after flexible connection (suction)
 - b. Test readings:
 - 1) Horizontal, velocity and displacement
 - 2) Vertical, velocity and displacement
 - 3) Axial, velocity and displacement
 - c. Normally acceptable readings, velocity and acceleration
 - d. Unusual conditions at time of test
 - e. Vibration source (if non-complying)

END OF SECTION

MAI: 2021-1551

SECTION 23 07 13 - EXTERNAL DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES EXTERNAL INSULATION FOR:

- A. Supply air ducts. Note: See drawings or Section 230825, internal duct cover, for notes on whether the supply air ductwork downstream of VAV boxes is to be insulated. If drawings or Section 230825 call for internal duct insulation, delete external duct insulation downstream of the VAV box.
- B. Return air ducts.
- C. Outside air intake ducts.
- D. Combustion and relief air ducts.
- E. Boiler and water heater breeching and stacks, engine exhaust pipes (high temp. insulation to 1200°F).
- F. Ducts located outdoors.
- G. Kitchen hood exhaust duct insulation.
- H. Furnace exhaust vent pipes.
- I. All ducts located in unconditioned attic spaces.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
 - 1. American Society for Testing of Materials and Specifications:
 - a. ASTM C533, "Standard Specification for Calcium Silicate Pipe and Block Insulation"
 - b. ASTM C553, "Standard Specification for Mineral Fiber Blanket and Felt Insulation"
 - c. ASTM C612, "Standard Specification for Mineral Fiber Block and Board Thermal Insulation"
 - d. ASTM C1136, "Standard Specification for Barrier Material, Vapor," Type 1 or 2 (jacket only)

- B. Insulation materials, including all weather and vapor barrier material, closures, hangers, supports, fitting covers, and other accessories shall be furnished and installed in strict accordance with project drawings, plans and specifications.

1.4 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct fabrication and installation of thermal insulation applied to commercial ductwork systems in accordance with the applicable project specifications, and drawings, subject to the terms and conditions of the contract.
- B. The above temperature ranges are typical for these systems. However, if contract specifications call for service temperatures outside the above ranges, consult the manufacturer's published data to determine the operating temperature limitations of the insulation products or products under consideration.

1.5 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state with or without binder.
- B. Exposed ductwork shall include ductwork installed in areas used by personnel in the normal use of the building, such as finished work rooms, offices, mechanical rooms, storage rooms, etc.
- C. Exposed finished areas include areas that normally have finished walls, ceilings, floors, etc. such as offices.
- D. Concealed ductwork shall include ductwork installed in areas similar to pipe tunnels, covered pipe trenches, spaces inside walls, duct or pipe shafts, spaces above dropped ceilings, unfinished attic spaces, crawl spaces, etc.

1.6 SYSTEM PERFORMANCE

- A. Insulation materials furnished and installed hereunder should meet the minimum economic insulation thickness requirements of the North American Insulation Manufacturer's Association (NAIMA) (Formerly known as TIMA), to ensure cost effective energy conservation performance. Alternatively, materials should exceed the minimum thickness requirements of National Voluntary Consensus Standard 90.1 (1989), energy Efficient Design of New Buildings", of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall be Class A, maximum of 25 flame spread, 35 fuel contributed and 50 smoke developed rating and shall meet the fire hazard requirements of the following specifications:
 - 1. American Society for Testing of Materials ASTM E84
 - 2. Underwriter's laboratories, Inc. UL 723
 - 3. National Fire Protection Association NFPA 255

- C. Calcium silicate products shall include a visual identification system to permit positive field determination of their asbestos-free characteristic.

1.7 QUALITY ASSURANCE

- A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications.
- B. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

1.8 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during and after installation. No insulation materials shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- C. If any insulation material has become wet the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 PRODUCTS

2.1 DUCTWORK AND STACKS LOCATED INDOORS

- A. Ductwork shall be externally insulated with Fiberglas insulation in blanket, batt or board form, selected to conform readily to the surface to which it will be applied. Vapor barrier shall be legibly printed by the manufacturer to indicate nominal thickness, R-value and type of insulation. External insulation shall be as follows:
 - 1. Concealed Ductwork
 - a. Rectangular, round or oval ductwork: Fiberglas All-Service duct wrap, light density glass fiber insulation in roll form, 1½" thick, 1.0 lb per cubic foot density, faced with a reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
 - 2. Ductwork Located in Attic Space

- a. Rectangular, round or oval ductwork: Fiberglas All-Service duct wrap, light density glass fiber insulation in roll form, 2" thick, 1.0 lb per cubic foot density, faced with a reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
3. Exposed Rectangular Ductwork
 - a. Rectangular: Fiberglas type 705, 2" thick, 3.0 lbs per cubic foot density insulation, heavy density glass fiber insulation in semi-rigid or rigid board form, faced with reinforced foil/kraft laminate vapor barrier. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
4. Exposed Round or Oval Ductwork
 - a. Cross Section less than 10" diameter: Fiberglas all-service duct wrap, 1½" thick, 1.5 lb per cubic foot density, with FSK foil face. All joints shall be stapled with outward clinching staples and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping. If installed in high abuse areas like gymnasiums or locker rooms, use 1" thick elastomeric with foil type wrap (similar to Venture Clad Plus).
 - b. Cross section 10" or more in diameter: Fiberglas, Pipe and Tank Insulation, heavy density glass 1½" thick 4.5 lb per cubic foot density, semi-rigid insulation, end grain factory-adhered to ASJ all-service jacket. All joints shall be stapled with outward clinching staples where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
5. Boiler or Water Heater Stack.
 - a. 2" thick Owens-Corning Calcium Silicate block insulation, rated for maximum operating temperature of 1200°F, rigid hydrous asbestos-free calcium silicate block insulation. Molded flat blocks shall be used for flat surfaces. V-grooved block shall be used on curved surfaces, and shall be such that the V-grooves close tightly over the curved surface.
 - 1) Insulation shall be mechanically fastened in place by bands wired or welded to rods or studs.
 - 2) A troweled coat of insulating cement shall be used to provide the base for the finished surface.
 - 3) The insulation shall be protected with a .016 aluminum jacket. ASJ jacketing shall not be used over calcium silicate.
6. Accessory Materials
 - a. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):

- 1) Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure sensitive tapes.
 - 2) Field-applied jacketing materials - Sheet metal, plastic, canvas, fiberglass cloth, insulating cement; PVC fitting covers.
 - 3) Support materials - Hanger straps, hanger rods, saddles.
 - 4) Fasteners, weld pins/studs, speed clips, insulation washers.
 - 5) Metal mesh or expanded metal lagging.
- b. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards".
7. Ductwork Located Outdoors
 - a. All ductwork (supply, return, exhaust, outside air, relief air) located outdoors shall be covered externally with either 2" of flexible elastomeric closed-cell insulation or 2" of Foamglas® closed cell insulation.
 - b. Installation shall meet manufacturer's recommendations, with all joints firmly butted and secured with adhesives or fasteners.
 - c. All ductwork insulation shall be jacketed with a multi-ply, fabric reinforced, self-adhesive insulation cladding material with a vapor barrier and a thickness of 0.015". Jacketing system shall be Venture Clad Plus #1579CW-E, or equal.
 - d. Install all insulation and jacketing in accordance with manufacturer's installation instructions.
 - e. Rectangular ductwork shall be installed with a crown or slope on top to prevent water from ponding. Insulation and jacketing shall be installed on top of duct and crown or slope shim.
 - f. Jacketing shall be installed to each of the sides separately, starting with bottom, then sides and finally the top. Each side shall overlap the other by 3". The sides shall overlap the bottom and the top shall overlap the sides.
 - g. All jacketing seams must be taped with manufacturer's recommended jointing/seaming tape.
 - h. All underlying foil faced insulation must be sealed with foil or FSK tape.
8. Ductwork Located in Unconditioned Attic Space
 - a. All ductwork routed through unconditioned attic spaces shall be insulated, even if not called to be insulated, when located in an unconditioned space. Supply air ductwork insulation thickness in an unconditioned attic space shall be twice (double) the insulation thickness listed in the specification.

PART 3 EXECUTION

3.1 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

- A. Ensure that all seams and joints in ductwork have been sealed by the contractor responsible for duct systems.
- B. Ensure that pressure testing of duct systems has been completed prior to installing insulation.
- C. Ensure that all duct surfaces over which or within which insulation is to be installed are clean and dry.
- D. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

3.3 INSTALLATION

- A. General
 - 1. Install insulation in accordance with manufacturer's published instructions and recognized industry practice to ensure that it will serve its intended purpose.
 - 2. Install insulation materials with smooth and even surfaces. Butt joints firmly together to ensure complete and tight fit over surfaces to be covered.
 - 3. Maintain the integrity of factory-applied vapor barrier jacketing on all insulation, protecting it against puncture, tears or other damage. All staples used on ductwork insulation shall be coated with suitable sealant to maintain vapor barrier integrity.
- B. Penetrations
 - 1. Extend ductwork insulation without interruption through walls, floors etc., except at fire dampers or unless noted otherwise.
- C. Duct Wrap Insulation
 - 1. Insulation shall be applied to sheet metal ductwork or plenums with all joints butted firmly together, using manufacturer's recommended stretch-out tables (see Owens-Corning Pub. No. 3-MS-9266) to prevent excessive compression. Insulation shall be secured with mechanical fasteners spaced at 16" maximum centers on the bottom of 24" or wider ducts to prevent the insulation from sagging.

2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.

D. Rigid Insulation

1. Board shall be secured to ductwork with adhesive or with mechanical fasteners with welded pins, secured with insulation caps and washers matching color of the vapor barrier facing. If used, mechanical fasteners shall be within 3" (max.) of board edges, 12" maximum on center.
2. All joints shall be firmly butted together and where a vapor barrier is required, sealed with pressure sensitive tape matching the facing, FRK backing stock or glass fabric and mastic. Adjacent sections shall be tightly butted with the 2" tape flap overlapping.
3. Corner angles shall be installed on all external corners of rigid duct insulation in exposed finished areas before jacketing, except kitchen hood exhaust duct insulation which shall have no corner angles.

3.4 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.5 PROTECTION

- A. Replace damaged insulation which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. Protect the insulation work during the remainder of the construction period to avoid damage and deterioration of the finished insulation work.

3.6 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

3.7 ASBESTOS INSULATION

- A. Any existing asbestos insulation on existing ductwork, equipment, etc. where tie-ins are required, shall be removed by the Owner at the Owner's expense. The Contractor and Architect/Engineer shall not be responsible for any cost or work involved with removal or encapsulation of asbestos insulation.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

END OF SECTION

MAI: 2021-1551

SECTION 23 30 00 - AIR DISTRIBUTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Casing and plenums.
- D. Single wall spiral duct and fittings
- E. Insulated double wall spiral duct and fittings
- F. Dampers.
- G. Duct cleaning.
- H. Roof hoods, exhaust fans, grilles and louvers.
- I. Return air fan.
- J. Boiler stack and breeching.
- K. Water heater stack and breeching.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ASTM A36 - Structural Steel.
- B. ASTM A90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- D. ASTM A366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
- E. ASTM A480 - General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
- F. ASTM A525 - General Requirements for Steel Sheet.
- G. ASTM A527 - Steel Sheet, Zinc Coated (Galvanized) by Hot Dip Process, Lock Forming Quality.
- H. ASTM A568 - Steel, Sheet, Carbon, and High-Strength, Low Alloy, Hot-Rolled and Cold-Rolled.

- I. ASTM A569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality.
- J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- K. AWS D9.1 - Welding of Sheet Metal.
- L. NBS PS 15 - Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment.
- M. NFPA 54 - National Fuel Gas Code.
- N. NFPA 70 - National Electric Code.
- O. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- P. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
- Q. SMACNA - HVAC Air Duct Leakage Test Manual.
- R. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- S. SMACNA - Fibrous Glass Duct Construction Standards.
- T. UL 33 - Heat Responsive Links for Fire Protection Systems.
- U. UL 181 - Factory-Made Air Ducts and Connectors.
- V. UL 555 - Fire Dampers and Ceiling Dampers.

1.3 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and performing all operations required, for the correct and complete fabrication and installation of ductwork in accordance with the applicable project specifications, drawings, codes, regulations and standards.

1.4 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes will be permitted except by written permission from the Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Maintain one copy of document on site.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing the work of this section with minimum five years experience.

1.7 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and SMACNA standards, latest edition.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealants.

1.9 SPECIAL INSPECTION FOR SMOKE CONTROL (per Michigan Building Code 1704.14)

- A. Special Inspection for Smoke Control: Smoke control systems shall be tested by a special inspector.
- B. Testing scope: The test scope shall be as follows:
 - 1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
 - 2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements, and detection and control verification.
- C. Qualifications: Special inspection agencies for smoke control shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

PART 2 PRODUCTS

2.1 DUCT - SHEET METAL HVAC DUCTWORK

- A. Galvanized Steel Ducts: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.
- B. Fasteners: Rivets, bolts, or sheet metal screws.
- C. Sealant:
 - 1. Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. All ductwork joints, connections, etc. shall be sealed.
- D. Duct Hangers: Rod and trapeze duct support shall be used for all ductwork with one dimension 18" or larger. Smaller duct may be installed with strap hanger system using SMACNA Standard as minimum.

1. Hanger Rod: ASTM A36; steel; threaded both ends, threaded one end, or continuously threaded, with steel angle trapeze and non-eccentric beam clamps.
2. Hanger rods, angles trapeze sizing and spacing shall meet SMACNA standards, and local and state building codes for duct sizes being supported.
3. Straps and hanger attachment system sizing, spacing, and installation shall meet SMANCA Standards, local and state building codes, etc. for duct size and supports.
4. Duct hangers shall not be supported from metal deck. Furnish and install all support steel as required to suspend with beam clamps similar to Grinnell Fig. 260 from structural steel joists or beams.

2.2 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6" w.c. on upstream side (higher pressure side) of variable air volume boxes. Return air duct, exhaust air duct and downstream side of variable air volume boxes (low pressure side) shall be constructed to not less than 2" w.c.
- B. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on centerline. Where not possible, and engineer's written approval is obtained, rectangular elbows may be used, provided turning vanes are utilized. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.
- F. Duct Sealant
- G. All ductwork including supply air, outside air, return air, exhaust air and relief air ductwork shall have joints sealed.
 1. Ductwork designed at SMACNA 6" pressure shall meet SMACNA Class "A" seal requirements.
 2. Ductwork designed at SMACNA 2" pressure shall meet SMACNA Class "C" seal requirements.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Provide duct material, gages, reinforcing, and sealing for operating pressures not less than 6" w.c. unless otherwise noted on drawings.
1. Flat Oval Ducts:
 - a. Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.
 2. Double Wall Insulated Flat Oval Ducts:
 - a. Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 1 inch (25 mm) thick fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
 3. PVC Coated Steel Ducts:
 - a. UL 181, Class 1, galvanized steel duct coated with polyvinyl chloride plastic, 4 mil (0.1 mm) thick on outside and 2 mil (0.05 mm) thick on inside.
 4. Double Wall Insulated Round Ducts:
 - a. Round spiral lockseam duct with galvanized steel outer wall, 1 inch (25 mm) thick fiberglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.
 5. Transverse Duct Connection System:
 - a. SMACNA rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips for not less than 6" w.c. operating pressure unless otherwise noted on drawings.

2.4 SINGLE WALL SPIRAL DUCT AND FITTINGS

- A. General
1. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings and who has been in business for at least ten (10) years. All spiral duct and fittings shall be manufactured by the same firm and shall be as shown on the contract drawings.
 2. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements, with a prime coat finish.
- B. Construction
1. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps to spiral duct shall not be allowed without written approval of the engineer. Manufacturer's published individual fitting performances shall be on file with the design engineer ten (10) days prior to bid.
 2. All elbows shall be fabricated with a centerline radius of 1.5 times the diameter. 90° and 45° elbows in diameters 3" round through 10" round shall be stamped or pleated elbows. All other elbows shall be of the gored type, fabricated in accordance with the following:

<u>DEGREE OF ELBOW</u>	<u>NUMBER OF GORES</u>
less than 36°	2

37° thru 71°	3
72° thru 90°	5

Where it is necessary to use two-piece mitered elbows, they shall have a minimum number of vanes in accordance with the following:

<u>DUCT DIAMETER</u>	<u>NUMBER OF VANES</u>
3" thru 9"	2
10" thru 20"	3
21" and up	5

3. Circumferential and longitudinal seams of all fittings shall be a continuous weld or spot welded and sealed with mastic. All welds shall be painted to prevent corrosion.
4. All field joints up to and including 60" shall be made with a 2" slip-fit or slip coupling. Diameters 62" round and larger shall be joined with 2"x2"x3/16" Vanstone flanges for fittings and solid welded flanges for spiral duct.
5. Proprietary connectors such as manufactured by Ductmate or AccuFlange may also be used in lieu of slip connections or angle flanges.
6. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.
7. All flanges and access doors shall be factory installed. Shipments of loose flanges, access doors or taps for field installation into spiral duct will not be allowed.

C. Metal Gauges

1. Metal gauges for single wall round ducts shall be as follows:

- a. Round ducts with maximum 2" W.G. positive static pressure:

<u>DUCT DIAMETER</u>	<u>SPIRAL DUCT</u>	<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>
3" thru 26"	26	24
28" thru 36"	24	22
38" thru 50"	22	20
52" thru 60"	20	18
62" thru 78"	18	16

- b. Round ducts with maximum 2" W.G. negative static pressure:

<u>DUCT DIAMETER</u>	<u>SPIRAL DUCT</u>	<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>
3" thru 17"	26	24
18" thru 20"	24	22
21" thru 22"	24	20
24" thru 26"	22	20
28" thru 30"	22	18
32" thru 34"	20	18
36" thru 42"	20	16

44" thru 48"	20	18(note 1 & 3)
50" thru 60"	18	18(note 2 & 3)

Notes:

1. Reinforce with 1"x1"x1/8" girth rings every 6 feet.
 2. Reinforce with 1 1/4" x 1 1/4" x 3/16" girth rings every 4 ft.
 3. When companion flange joints are used as reinforcement, 44" to 48" diameter shall be 2"x2"x3/16" and 50" to 60" diameter shall be 2 1/2"x2 1/2" x 3/16".
- D. Manufacturers
1. All spiral duct fittings shall be as manufactured by SEMCO Incorporated or approved equal.

2.5 INSULATED DUAL WALL SPIRAL DUCT AND FITTINGS

A. General

1. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings and who has been in business for at least ten (10) years. All spiral duct and fittings shall be manufactured by the same firm and shall be as shown on the contract drawings.
2. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements, and shall have double wall construction with internal 1" fiberglass insulation, perforated galvanized liner, and exterior prime coat finish.

B. Construction

1. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps to spiral duct shall not be allowed without written approval of the engineer. Manufacturer's published individual fitting performances shall be on file with the design engineer ten (10) days prior to bid.
2. All elbows shall be fabricated with a centerline radius of 1.5 times the diameter. 90° and 45° elbows in diameters 3" round through 10" round shall be stamped or pleated elbows. All other elbows shall be of the gored type, fabricated in accordance with the following:

<u>DEGREE OF ELBOW</u>	<u>NUMBER OF GORES</u>
less than 36°	2
37° thru 71°	3
72° thru 90°	5

Where it is necessary to use two-piece mitered elbows, they shall have a minimum number of vanes in accordance with the following:

<u>DUCT DIAMETER</u>	<u>NUMBER OF VANES</u>
3" thru 9"	2
10" thru 20"	3
21" and up	5

3. Circumferential and longitudinal seams of all fittings shall be a continuous weld or spot welded and sealed with mastic. All welds shall be painted to prevent corrosion.
4. All field joints up to and including 60" shall be made with a 2" slip-fit or slip coupling. Diameters 62" round and larger shall be joined with 2"x2"x3/16" Vanstone flanges for fittings and solid welded flanges for spiral duct.
5. Proprietary connectors such as manufactured by Ductmate or AccuFlange may also be used in lieu of slip connections or angle flanges.
6. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.
7. All flanges and access doors shall be factory installed. Shipments of loose flanges, access doors or taps for field installation into spiral duct will not be allowed.
8. The spiral duct shall be double wall and shall be constructed of an outer shell, a 1" thick layer of fiberglass insulation, and an inner metal liner. Insulation shall have a thermal conductivity "K" factor of .26 BTU/hr./sq.ft./°F or less.
9. The inner metal liner for all spiral and longitudinal seam duct shall be perforated metal. All fittings from fan discharge to a point where 35 lineal feet of spiral duct has been used shall have a perforated metal liner. All other fittings shall have a solid metal liner which may be one even gauge lighter than that shown for perforated liners.

C. Metal Gauges

1. Metal gauges for dual wall round ducts shall be as follows:

- a. Round ducts with maximum 2" W.G. positive static pressure

<u>INSIDE DIAMETER</u>	<u>SPIRAL DUCT</u>		<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>	
	<u>SHELL</u>	<u>PERF. LINER</u>	<u>SHELL</u>	<u>PERF. LINER</u>
3" thru 8"	26	26(non-ribbed)	24	24
9" thru 24"	26	26(ribbed)	24	24
26" thru 34"	24	26(ribbed)	22	24
36" thru 48"	22	26(ribbed)	20	22
50" thru 58"	20	26(ribbed)	18	22
60" thru 62"	18	26(ribbed)	16	22
62" thru 76"	18	22(non-ribbed)	16	22

- b. Round ducts with maximum 2" W.G. negative static pressure.

<u>INSIDE DIAMETER</u>	<u>SPIRAL DUCT</u>		<u>FITTINGS AND LONGITUDINAL SEAM DUCT</u>	
	<u>SHELL</u>	<u>PERF. LINER</u>	<u>SHELL</u>	<u>PERF. LINER</u>
3" thru 8"	26	26(non-ribbed)	24	24
9" thru 15"	26	26(ribbed)	24	24
16" thru 20"	24	26(ribbed)	22	24
22" thru 24"	22	26(ribbed)	20	24
26" thru 28"	22	26(ribbed)	18	24
30" thru 32"	20	26(ribbed)	18	24

34" thru 40"	20	26(ribbed)	16	22
42" thru 46"	20	22(non-ribbed)	18(see notes)	22
48" thru 58"	18	22(non-ribbed)	18(see notes)	22

Notes:

1. Reinforce with 1"x1"x1/8" girth rings every 6 feet.
 2. When companion flange joints are used as reinforcement, 44" to 48" diameter shall be 2"x2"x3/16" and 50" to 60" diameter shall be 2½"x2½" x 3/16".
- D. Manufacturers
1. All spiral duct fittings shall be as manufactured by SEMCO Incorporated or approved equal.

2.6 CASINGS

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Construct for not less than 6" w.c. unless otherwise noted on drawings.
- B. Mount floor mounted casings on concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
- D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

2.7 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
1. Less Than 12 Inches Square: Secure with sash locks.
 2. Up to 18 Inches Square: Provide two hinges and two sash locks.
 3. Up to 24 x 48 Inches: Three hinges and two compression latches with outside and inside handles.
 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.8 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.9 EQUIPMENT FLEXIBLE DUCT CONNECTIONS (To air moving equipment.)

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.
- B. Connector: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - 2. Net Fabric Width: Approximately 3 inches wide.
 - 3. Metal: 3 inch wide 24 gage galvanized steel.

2.10 FLEXIBLE INSULATED DUCTS

- A. All flexible ducts used to connect diffuser, grilles, etc. shall be similar to Flexmaster USA, Inc.; Type #3. Flex duct shall be insulated type consisting of a factory fabricated assembly of a trilaminate of aluminum foil, fiberglass and polyester. It shall be mechanically locked without adhesive into a formed aluminum helix on the ducts outside surface and shall withstand a minimum 6" w.c. operating pressure. The duct material shall be factory wrapped in a thick blanket of fiberglass insulation with a "C" factor of .25 or less. The insulation shall be encased in a fire retardant polyethylene protective vapor barrier with a perm rating of not over 0.1 grains per square foot per hour per inch of mercury. The flexible duct shall be constructed in accordance with and be listed as UL 181 Class I air duct and comply with NFPA 90A and 90B and have a flame spread of not over 25 and a smoke developed of not over 50. The flexible duct shall have a minimum pressure rating of 12" w.c. through a temperature range of -20°F to 250°F. Flexible duct shall be UL rated.
- B. Maximum length of flexible duct shall be 5'-0" to each outlet unless indicated otherwise on drawing.
- C. Flexible duct shall be installed without bends unless so indicated on drawing.

2.11 DUCT SPIN-IN FITTINGS

- A. Low pressure spin-in fittings (take-offs from main duct to flexible duct) shall be similar to Flexmaster USA, Inc. Model CB-D conical bellmouth fitting with damper and positive locking wing nut. Edges of the take-off opening in the duct shall be sealed with fire retardant duct sealer.

2.12 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension, steel construction, with individually adjustable blades and mounting straps.

2.13 BACKDRAFT DAMPERS.

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturers standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: 16 gage thick galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.14 FIRE, SMOKE AND COMBINATION FIRE/SMOKE DAMPERS

- A. Fire dampers shall be fabricated in accordance with NFPA 90A and UL 555. They shall have a minimum rating of 1½ hour, have a dynamic closure rating of 3,000 fpm and 6" wg and be so identified with a UL label. Smoke dampers shall be fabricated in accordance with NFPA 90A and UL 555S with same rating as fire damper and be so identified with a UL label. Smoke damper shall be opposed blade type, normal functions to close automatically and opened by a factory installed electric actuator. A smoke damper may also be a fire damper if it's location lends itself to the multiple functions and it meets the requirements of both.
- B. Provide factory sleeve and collar for each damper.
- C. Operators: Factory installed UL listed and labeled spring closed motorized open, electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.
- D. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening by gravity upon actuation of electro-thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.
- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro-thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- F. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side with locking clip.
- G. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- H. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations and closure under air flow conditions. Configure with blades out of air stream.

- I. Fusible Links: Listed for 165 degrees F unless higher or lower temperature rating is required. Contractor shall verify usages and ratings for fusible link temperature rating.

2.15 VOLUME CONTROL DAMPERS.

- A. Provide balancing dampers on all duct take-offs to diffusers, grilles and registers; at points on supply, return and exhaust systems where branches take off from larger ducts, as required for air balancing (install damper a minimum of 2 duct widths from take-off; as required by balancing agency; and where indicated on drawings. Where access to dampers cannot be achieved, access panels shall be installed. If access panels are not preferred, remote dampers shall be installed. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. All dampers shall have a locking device per SMACNA Standards, to hold the damper in a fixed position without vibrating.
- B. Splitter Dampers:
 - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum ¼ inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.16 ROOF CURBS

- A. The mechanical trades shall be responsible for furnishing and setting in place all mechanical equipment, roof curbs and piping/duct roof curbs. The general trade shall be responsible for the roof work and associated flashing. The mechanical trade shall furnish and install treated wood base blocking as required to level curb and to match roof insulation thickness. Curb shall be as specified, or if not specified should be similar to Pate or Thy-curb with heavy gauge galvanized steel, insulated and with wood nailer. Height of curb scheduled or specified shall

be height required to top of curb above finished roof. If height is not specified or noted, a minimum 12" high above finished roof will be required. (pipe support units shall be at height required). Rooftop units will be shipped knocked down with the mechanical trade responsible for assembly on site. Roof curb shall mate with unit and provide support and a watertight installation.

2.17 EXHAUST FANS

- A. See schedules on drawings and furnish all.

2.18 DIFFUSERS AND GRILLES

- A. See schedules on drawings and furnish all.

2.19 LOUVERS

- A. See schedule on drawings and furnish all.

2.20 RETURN AIR FAN

- A. The contractor shall furnish and install the indoor return air fan as shown and scheduled on the plans. The units shall be installed in strict accordance with the specifications. All units shall be complete with fan section, and all accessories specified.
- B. Unit Casing
 - 1. Unit shall be constructed of a complete frame with removable panels. Removal of side panels must not affect the structural integrity of each module. The casing must be able to withstand up to six inches positive or four inches negative pressure. All exterior wall panels shall be made of minimum 18 gauge G90 galvanized steel. Closed cell foam gasketing shall be where modules are joined.
 - 2. Full sized hinged removable double wall access doors with two step safety handles shall be provided for quick access to the interior of the unit casing. Doors attached by screws or doors not continuously gasketed are not acceptable.
- C. Casing Options
 - 1. Unit shall be double-wall constructed to prevent fiberglass erosion into the airstream and to allow cleaning of the unit interior. Interior wall shall be tenacious thick of either 20 gauge solid or 18 gauge perforated plate galvanized steel. Foil faced insulation is not acceptable.
 - 2. Units shall ship fully assembled (within freight limitations) on a minimum 10 gauge galvanized steel base rail/housekeeping pad.
 - 3. All panels shall be sealed with closed cell foam gasketing.
 - 4. An eight by ten inch view window shall be provided on modules where scheduled.
 - 5. A marine light shall be provided on fan and access modules where scheduled.
- D. Insulation
 - 1. Double wall units shall be factory insulated with 1½ pound density insulation. All connecting channels shall be insulated to prevent sweating.

E. Fans

1. Fans shall be double width, double inlet, multi-blade type as manufactured by the unit manufacturer. Fans shall be forward curve (FC), backward inclined (BI) or backward inclined airfoil (AF) as required for stable operation.
2. Housed fan performance shall be certified as complying with ARI Standard 430-89. Centrifugal fans shall be dynamically balanced at the factory as a complete fan assembly (fan wheel, motor, drive and belts). Fan shafts shall not exceed 75 percent of their first critical speed at any cataloged rpm.
3. Fans shall be equipped with self aligning, anti-friction pillow block bearings with a minimum life of L-50 200,000 hours. Bearing shall be equipped with grease lines allowing for lubrication from one side of the fan.
4. Fan and motor assembly shall be internally isolated from unit casing with spring isolators, furnished and installed by unit manufacturer. Fan scroll shall be attached to the unit casing by a flexible canvas duct.
5. Unit sizes 35 and larger shall be provided with a totally enclosed galvanized expanded metal belt guard. The belt guard shall be rigidly attached to the bearing support structure and have a two-piece removable front panel. A tach hole shall be provided opposite the fan shaft. The belt guard shall be a universal size to accommodate any applicable drive.

F. Motors

1. Motors shall be mounted integral to an isolated fan assembly furnished by the unit manufacturer. Motors shall be mounted inside the unit casing. Motors shall be mounted on a slide base to permit adjustment of drive belt tension.
2. Motor shall conform with requirements of Section 23 05 00 of these specifications.

G. Drives

1. Drives shall be constant speed with fixed pitch sheaves.
2. Drives shall be selected at 1.5 service factor.

2.21 PRESSURE STACK AND BREECHING

- A. The pressure stack and breeching system shall be Ampco Model VSI-II, Metal-fab Model PIC or Selkirk Metalbestos Model PS. The system shall be a double wall factory-built modular connector, manifold and stack system and shall be laboratory tested and listed by Underwriters Laboratories for use with building heating equipment and appliances which produce exhaust flue gases at a temperature not exceeding 1000° Fahrenheit (F) under continuous operating conditions and not exceeding 1400°F under intermittent operating conditions (see UL 103) when burning gaseous, solid or liquid fuels as described in NFPA 211. The stack system shall be designed and installed to be gas tight and thus prevent leakage of combustion products into a building. The system shall be designed to compensate for all flue gas induced thermal expansions.
- B. The double wall stack and breeching shall have an inner gas carrying pipe of type 304 stainless steel for gas and #2 fuel oil and type 316 stainless steel for #4, #5, or #6 oil; coal; or any other solid fuel. There shall be a nominal 1 inch air space between the walls. The outer jacket shall be Type 304 stainless steel. The materials and construction of the modular sections and accessories shall be as specified by the terms of the product's UL listing.

- C. All accessories shall be provided to meet all codes and applicable standards. Inner pipe joints shall be sealed by use of factory supplied V Bands and sealant as specified in the manufacturer's installation instructions. Roof penetrations shall be suitable for a combustible roof. Unit shall be according to the manufacturer's detail drawings and installation instructions.
- D. The breeching and the stack shall be warranted against functional failure due to defects in material and manufacturer's workmanship for a period of at least ten years from date of delivery.
- E. Shop drawings showing the actual layout and drawn to scale shall be submitted by the manufacturer to the Engineer for review. The system shall be installed as designed by the manufacturer and in accordance with the terms of the manufacturer's 10-year warranty and in conjunction with sound engineering practice.
- F. The inner diameter for breeching and stack shall be verified by the manufacturer's computations. The computation shall be technically sound, shall follow ASHRAE calculation methods, and incorporate the specific flow characteristics of the inner pipe. The contractor shall furnish the exact boiler model and operating characteristics to the factory representative. Operating characteristics shall include flue gas flow rate, BTU input, outlet temperature, local altitude, stack layout, and available external pressure at boiler outlet, etc., necessary to determine system operation at maximum and minimum levels of burner turndown range.
- G. Technical Services Support: the factory-built modular stack system shall be furnished by a vendor organization which assures design, installation and services coordination; and provides in-warranty and post-warranty unified responsibility for Owner, Architect, Consulting Engineer and Contractor.

PART 3 EXECUTION

3.1 DUCT INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible as a minimum. Where requirements are specified in this specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed. Note: All ductwork joints, fittings, etc. shall be sealed.
- C. Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork for pitot tube where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- F. Use crimp joints with bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Slope underground ducts to plenums or low pump out points at 1/8" per foot. Provide access doors for inspection.
- I. Tape joints of PVC coated metal ductwork with PVC tape.
- J. Insulate buried supply duct runs with two inch thick insulation styrofoam covered with plastic vapor barrier.
- K. Connect flexible ducts to metal ducts mechanically without adhesives. Connect outlets to low pressure ducts with flexible duct held in place with strap or clamp.
- L. Coordinate duct locations with available space, route ducts around obstructions as required, and review duct changes with Engineer, all before starting construction.
- M. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- N. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out. Use stainless steel for ductwork exposed to view and stainless steel or carbon steel for ducts where concealed.
- O. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- P. Install manual balancing dampers in ductwork at all branch take-offs, all diffuser and grille take offs, etc.
- Q. Install roof exhaust fans on minimum 18" high roof curbs but not less than 12" higher than parapet walls within 10'-0" of fan.

3.2 DUCT CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

3.3 SMOKE AND FIRE DAMPER PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.4 FIRE DAMPER, ACCESS DOOR AND FLEXIBLE DUCT INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible for 6" pressure duct system as a minimum. Where requirements are specified in this

specification, or noted on drawings above the minimum SMACNA Standards, the more stringent specified and noted requirements and practices shall be followed.

- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ductwork in accordance with NFPA 96. Provide minimum 12x12 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated unless limited by duct size.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges in accordance with NFPA 92A and the latest edition of "SMACNA State Fire Marshal, Fire and Smoke Damper Clarification" manual as published by SMACNA.
- F. Demonstrate re-setting of fire dampers to Owner's representative.
- G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Use splitter dampers only where indicated.
- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- K. Provide balancing dampers where recommended by balancing agency.

3.5 DIFFUSER AND GRILLE INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, whether dampers are specified as part of the diffuser, grille or register assembly.

- E. Paint ductwork visible behind air outlets and inlets matte black.
- F. Diffuser/grille color shall be selected from the full range of manufacturer available colors and finishes.

3.6 BOILER STACK AND BREECHING INSTALLATION

- A. Boiler stack and breeching shall be installed in accordance with the manufacturer's installation instructions and shall meet all applicable codes and standards.

3.7 WATER HEATER STACK AND BREECHING

- A. Water heater stack and breeching shall be installed in accordance with the manufacturer's installation instructions and shall meet all applicable codes and standards.

END OF SECTION

SECTION 23 74 00 -ROOFTOP HVAC UNIT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Rooftop HVAC unit and accessories.

1.2 REFERENCES: Material and/or equipment specified in this section shall meet or exceed one or more of the property requirements or installation requirements of the following specifications/publications as applicable to the specific product or end use:

- A. ARI 210 - Unitary Air-Conditioning Equipment.
- B. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
- C. NFPA 70 - National Electric Code
- D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- E. ANSI/ASHRAE 90A - Energy Conservation in New Building Design
- F. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.

1.3 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on product offering.
- B. ISO 9001 Certification. The air handling manufacturer shall be ISO 9001 Certified by a third party registrar, such as HSB Registration Services, that is accredited by an accreditation body such as ANSI-RAB and / or RvC Dutch Council for Accreditation.
- C. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- D. Variable Air Volume Air Handling Units with Variable Inlet Vanes: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with ARI 430. Certify units with inlet vanes in wide-open position. If air handling units are not certified in accordance with ARI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- E. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with ARI 410-91.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.5 ACOUSTICS

- A. Manufacturer of packaged rooftop equipment shall provide Noise Criteria (NC) sound level data across all octave band center frequencies for cataloged operating range of unit at gross cooling capacity range. Data shall be obtained in conformance with ANSI S1.32-1980, American National Standard Methods for the Determination of Sound Power Levels of Discrete Frequency and Narrow Band Noise Sources in Reverberation Rooms and per AMCA Standard 300-85 test code "Sound Rating Air Moving Devices".

1.6 REGULATORY REQUIREMENTS

- A. Unit shall conform to ANSI/UL 465 for construction of packaged air conditioner and shall have U.L. label affixed to rooftop unit package. In the event the unit is not UL approved, the manufacturer shall, at his expense, provide for a field inspection by a UL representative to verify conformance to UL standards. If necessary, contractor shall perform required modifications to the unit to comply with UL, as directed by the UL representative, at no additional expense to the Owner.

1.7 EXTRA MATERIALS

- A. Install new clean filters at end of project. Provide one extra set of filters for future use by Owner at completion of project.
- B. Furnish one extra complete set of fan motor drive belts.

1.8 WARRANTY

- A. A parts warranty for one year from date of start-up or 18 months from date of shipment, whichever comes first, shall be provided at no additional cost.

PART 2 PRODUCTS

- 1. See drawings and furnish all.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Mount units on factory built roof mounting frame providing watertight enclosure. Install roof mounting curb level.

3.3 MANUFACTURER'S FIELD SERVICES & WARRANTY

- A. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit.
- B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.
- C. Furnish complete service and maintenance of units for one year from date of substantial completion.
- D. Furnish initial start-up and shut-down during first year of operation, including routine servicing and check-out. Furnish Owner's personnel training on operation and maintenance of rooftop unit.
- E. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
- F. Submit copy of service call work order on report to the Owner, and include description of work performed.
- G. The Sheetmetal Trade shall be responsible for installation and wiring of all rooftop unit manufacturer furnished accessories such as the economizer, power exhaust fan, roof curb, etc. The Sheetmetal Trade shall verify all work required during bidding and include all costs in their bid.

END OF SECTION

MAI: 2021-1551

SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Basic electrical Requirements specifically applicable to Division 26, 27 & 28 Sections, in addition to Division 1 - General Requirements.
- B. Information in this section is intended to clarify or make additions to the requirements set forth in the General Conditions, Supplementary Conditions and Division 1 of these specifications. Any conflict between Division 26, 27 & 28 and those in the General Conditions or within the Division 26 drawings, Supplementary Conditions and Division 1 shall be brought to the attention of the Architect/Engineer in writing as a request for addendum prior to the bid opening.
- C. Furnish all equipment, materials, articles, items, operations or methods listed, mentioned or scheduled on drawings, these specifications, manufacturer's installation instructions and include all labor materials, equipment and incidentals necessary for complete installation and operation.
- D. All information contained in this section applies to all sections within Division 26 as it was part of each section.
- E. Final walk-thru. Electrical Contractor shall submit in writing to the Architect's office or the Construction Manager advising that all of the Division 26, 27 & 28 work has been completed in accordance with the plans and specifications. The intent is to acknowledge the Contractor is ready for a walk-thru. Open items that are part of the required construction work should be completed prior to the final walk-thru to avoid developing a so called construction completion list. The engineer reserves the right to reschedule the final walk-thru as determined accordingly.
- F. Pre-bid questions. All pre-bid questions, clarifications, etc. must be submitted in writing to the Architect Office or the Construction Manager. All phone calls, faxes or e-mails from bidders and manufacturers, etc. directly received by the Engineers office during the bidding phase will be deferred back to the Architect Office or the Construction Manager.
- G. Electrical Contractor shall review all of the project plans and specifications and not rely solely on the electrical drawings to establish a project bid. Refer to the structural and mechanical drawings for final mechanical equipment locations. Mechanical drawings shall govern over the electrical drawing locations.
- H. Unit Pricing: Contractor shall furnish pricing as listed in the Bid Proposal Forms.
- I. The Contractor shall include in their bid any cost for requesting AutoCAD backgrounds for their use from the Architect or Engineer. The cost will be \$150.00 for the first plan, and \$50.00 for each additional plan that may be requested for AutoCAD use. A waiver of responsibility for the Architect and

Engineer related to Contractor use of the CAD files shall be signed by the Contractor.

1.2 LAYOUT OF THE WORK

- A. Examine the site and all the drawings before proceeding with the layout and installation of this work. Verify all door swings and clearances to cabinets, etc., before locating switch and outlet boxes. Locate conduit, boxes, etc., essentially as shown on the drawings but in exact layout determined on the job to suit actual conditions. Confer and cooperate with the other trades on the job so all parts will be installed in proper relationship. Precise locations of parts to coordinate with other work is the responsibility of the Contractor.
- B. The Electrical Trades shall complete all cutting and patching for the electrical work, unless noted or specified otherwise. Division 26, 27 & 28 Contractor shall be responsible to coordinate with the site Restoration Contractor for the new underground electrical work.
- C. Arrange exposed work as closely as practicable to wall or ceiling surfaces in an accurate alignment. Locate concealed work so fittings, connectors and other projections will clear surfaces. Exposed work is defined as non-finished spaces, such as mechanical/electrical rooms or as indicated on architectural room schedules. All finished spaces, installation shall be concealed. Refer to Architectural drawing for room finish schedules.
- D. During the bidding phase, if any design or discrepancy issues are discovered between the electrical drawings, specifications and other project plans, the contractor shall notify the Architect/Engineer. The intent is to resolve any issues during the bidding phase. For pertinent issues, addendums will be issued accordingly. After entering into a contract, it shall be considered there are no identified conflicts.
- E. No drilling of existing laminated beams for new work is permitted without review with the project Structural Engineer

1.3 INTERFERENCES

- A. The Electrical Contractor shall examine the plans of mechanical trades, the architectural and structural drawings and shall notify the Architect/Engineer to resolve such interference or discrepancy. The Electrical Contractor bid shall not be based solely on the Electrical Plans and Specifications. Contractor shall obtain and review all project documents. The Contractor, when directed, shall make such changes or off-sets as required so that the work shall be properly located and coordinated with the other trades. Failure to comply with the foregoing will not relieve contractor's responsibilities of making such changes. Such changes shall be completed at no additional cost to the Owner.
- B. All changes in location of equipment, fixtures, distribution equipment, receptacles, etc., from those shown on plans, shall be made without charge when directed by the Architect/Engineer before installation. At this time, an agreement shall be made if such a change is an additional cost to the owner.

- C. The Electrical Contractor shall confer with other trades regarding location and size of pipes, equipment, fixtures, conduit, duct openings, switches, outlets, etc., in order that there may be no interference in the installation of the work of any trades or delay in the progress of any work.
- D. The Electrical Contractor shall be responsible for confirming final receptacle, data, and switch heights at countertop and casework locations with the architectural details. Architectural details shall govern final locations and mounting heights. Failure to coordinate will not relieve the contractor of making changes as required, at no cost to the owner.
- E. Any changes made, necessary through failure to make proper arrangement to avoid interference, shall not be considered as extra.
- F. The Electrical Contractor shall cooperate with those performing work under other divisions in his preparation of interference drawings, to the extent that the location of plumbing piping, heating piping, and/or ventilation ducts, with respect to the installation of other trades, shall be mutually agreed on by those performing work under other divisions.
- G. In the event the described work on the drawings doesn't match requirements described in the specification, the more stringent shall be provided.
- H. Electrical Contractor shall review the Architectural drawings for work station, casework details and section drawings that show raceway details. Furnish the raceway as noted and detailed.
- I. Contractor shall carefully review the Code sections pertaining to safe working clearances to avoid piping, ducts interferences and other equipment. Install the electrical equipment to meet Code requirements. Adjust the locations shown as required.

1.4 TRENCHING AND RELATED UNDERGROUND WORK

- A. The Electrical Contractor shall contact "811" 72 hours prior to any excavation to locate existing underground utilities. Pay all costs to obtain the services of a specialty utility service company to locate all private utilities as required.
- B. Prior to any actual trenching, Electrical Contractor shall review the utility maps; shall visually observe and review the intended routing for above and below ground obstruction; shall confer with the appointed field representative, and shall establish preliminary location for trenching.
- C. After this routing is established, Contractor shall hand dig in areas of obstructions where powered equipment is non-accessible.

1.5 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished for installation on this project shall be new and in strict accordance with this specification. All packaged materials shall be delivered in the original containers which show the manufacturer's name and the identifying designations as to size, quality, etc. Materials delivered to the job in

unmarked or mutilated packages will be immediately inspected by the Contractor. Materials or equipment judged as "damaged" by the Contractor's own inspection shall be immediately addressed with the supplier. All electrical equipment shall bear the Underwriter's Label.

- B. All work shall be performed in a professional manner under the supervision of the electrical project manager. The project manager shall be considered the main point of contact for the Architect/Owner's daily communication.
- C. Should any dispute arise as to the quality or fitness of the materials or workmanship, Architect, Owner, Engineer and Electrical Contractor shall mutually agree work is non-acceptable and shall be reworked at no additional cost to the Owner.
- D. Division 26, 27 & 28 equipment schedule descriptions shall govern if it is found that the manufacturer's catalog numbering shown on the drawing is not current, or changed by the manufacturer without notification. Division 26, 27 & 28 Contractor shall notify the Architect/Engineer with any conflicts during the bidding phase to get clarifications. After entering into a Contract, it shall be considered the equipment schedules provide the information to meet the intended specifications for quality and performance.

1.6 GUARANTEES

- A. All equipment and work performed under Division 26, 27 & 28 shall be guaranteed for one (1) year from time of substantial completion of project, unless directed otherwise in Division 1.

1.7 VOLUNTARY ALTERNATES

- A. The Architect/Engineer will only accept voluntary alternate as a bid deduct. Alternate must maintain the same level of quality to meet the design intent. Voluntary alternates must be submitted with the bid for review by the Owner. Failure to comply will be no reason to accept any voluntary alternates after entering into a contract.

1.8 OWNERS ACCEPTANCE OF EQUIPMENT

- A. Refer to Division 1.
- B. Upon the Owner's written acceptance, the Electrical Contractor's guarantee period shall begin and the Owner shall accept the responsibility for operation and maintenance and the Contractor's liability shall be limited to the conditions covered in the guarantee as described in these specifications.

1.9 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.10 SUBMITTALS

- A. Submit electronic shop drawing files.
- B. Proposed Products List: Include Products specified in the following Sections:
 - 1. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
 - 2. Section 26 09 23 - Lighting Control Devices
 - 3. Section 26 22 13 - Dry Type Transformers
 - 4. Section 26 24 13 - Switchboards
 - 5. Section 26 24 16 - Panelboards
 - 6. Section 26 27 26 - Wiring Devices
 - 7. Section 26 28 16 - Enclosed Switches and Circuit Breakers
 - 8. Section 26 29 13 - Enclosed Controllers
 - 9. Section 26 51 00 - Interior Lighting
 - 10. Section 26 56 00 - Exterior Lighting
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.
- D. Mark dimensions and values in units to match those specified.
- E. Shop drawings shall be reviewed and checked by the Electrical Contractor for specification compliance prior to release for the Engineer's review. Failure to comply will be no cause or reason for additional costs to the Owner with project delays.
- F. Electrical distribution submittal shall include cut sheets for each piece of equipment. Written description is not acceptable.
- G. Bill of materials shall be submitted as part of O&M Manual. Bill of Materials is not considered a shop drawing.

1.11 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. Equipment: U.L. tested and approved for its purpose.
- D. The Electrical Contractor shall obtain and pay for all permits and inspection fees. Provide the Owner with final inspection documents from authorities having jurisdiction.
- E. State of Michigan, Bureau of Fire Services for Emergency Lighting and Fire Alarm Plan Review.
- F. Equipment: Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

- G. Life Safety NFPA 101 – The State of Michigan current adopted edition.
- H. Fire Alarm Code NFPA 72 – The State of Michigan current adopted edition.
- I. 2015 Michigan Energy Code.
- J. ASHRAE 90.1 2013 Edition.
- K. 2019 School Rules.

1.12 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on drawings, unless prevented by project conditions.
- B. All bidders shall personally inspect the site and acquaint themselves with all existing conditions involved in execution of this contract, and make all necessary measurements. No “extra” will be considered for additional work required because of bidder’s failure to do so.
- C. Arc flash warning labels. Provide arc flash generic warning labels in accordance with 2023 NEC Section 110 requirements.
- D. Provide PPE arc flash warning labels as specified with arc flash/short circuit coordination study

1.13 TEMPORARY SERVICES

- A. Division 26 Trades shall provide and maintain wiring for all interior construction lighting and power to meet OSHA Standards. Division 26 Trade shall provide and maintain all required lamps and guards. Contractor’s power tools, cords, etc. shall be in strict accordance with National Electrical Code 2023, Article 590.
- B. Electrical Contractor shall pay for all temporary internet and power for their office and or construction trailer.
- C. Electrical Contractor shall be responsible to review Division 1 requirements to provide project temporary lighting and power requirements for the construction and demolition phases.

1.14 RECORD DRAWINGS

- A. The Electrical Contractor shall furnish as-constructed drawings, including all Addendums, Bulletins and associated Field Directed Changes included as part of the record drawings.

1.15 OPERATION AND MAINTENANCE MANUALS

- A. Verbal instruction and written operational instructions are to be given on all equipment and systems under this contract. A time is to be scheduled with the Architect/Engineer and Owner for these instructions and a time submitted in writing for instructions at the facility.

- B. Two (2) bound sets of Operating and Maintenance Manuals are to be submitted to the Architect/Engineer for approval. Manuals are to include complete parts list and maintenance procedures as well as operating instructions on all equipment supplied under Division 26, 27 & 28.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes basic electrical requirements, which are applicable to all Division 26 sections.

1.2 REGULATORY REQUIREMENTS

- A. Conform to requirements of the applicable:
 - 1. Michigan Building Code
 - 2. National Fire Protection Association 70, 2023 National Electrical Code
 - 3. 2023 State of Michigan Electrical Code Rules Part 8
 - 4. 2017 ICC/ANSI A117.1
 - 5. Local Codes
 - 6. National Fire Protection Association 101, Life Safety Code
 - 7. National Fire Protection Association 72, Fire Alarm Code
 - 8. Other applicable National Fire Protection Association Codes
 - 9. State of Michigan Uniform Energy Code.

1.3 WORKMANSHIP

- A. Should any dispute arise as to the quality or fitness of the materials or workmanship, Engineer, Owner and Electrical Contractor shall mutually agree Work is non-acceptable and collaborate on an agreeable solution.
- B. All Division 26 Work shall be done under the direction of a currently licensed State of Michigan Master Electrician. All Work shall be provided in a professional manner.

PART 2 PRODUCTS

2.1 GENERAL PRODUCTS

- A. All Products, shall be listed by and shall bear the label of an approved Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupations Safety and Health Administration (OSHA), per the OSHA Nationally recognized Testing Laboratory Program. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by the owner, shall apply and such items shall bear those labels here one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, shall be so labeled.
- B. Where Products are used which defer in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned

space, and for obtaining the performance from the system into which these items are placed.

- C. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- D. All Products provided for installation on this project shall be new and in strict accordance with this specification. All packaged material shall be delivered in the original containers which show the manufacture's name and the identifying designations as to size, quality, etc. Material delivered to the Project in unmarked or mutilated packages will be ordered to be removed from the site at once. Materials or equipment judged as "damaged" by the Owner or Engineer shall be removed from the Project. All electrical equipment shall bear the Underwriters Label.
- E. All materials, shall be listed by and shall bear the label of an approved Nationally Recognized Testing Laboratory (NRTL) as identified by the United States Occupations Safety and Health Administration (OSHA), per the OSHA Nationally recognized Testing Laboratory Program. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, and approved by the owner, shall apply and such items shall bear those labels here one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, shall be so labeled.
- F. Divisions 26 Product schedule descriptions shall govern if it is found that the manufacture's catalog numbers as shown on the Drawings are not current or changed by the manufacturer without notification. Divisions 26 contractor shall notify the Engineer with any conflicts during the bidding phase to get clarifications. After entering into a Contract, it shall be considered the equipment schedules provide the information to meet the intended specification for quality and performance.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine the site and all the Drawings before proceeding with the layout and installation of this Work. Verify all door swings and clearances to cabinets, etc., before locating devices, boxes support Etc. Locate conduit, boxes, etc., essentially as shown on the drawings but in exact layout determined on the job to suit actual conditions. Confer and cooperate with the Owner and other trades performing Work on site so all parts will be installed in proper relationship. Precise locations of parts to coordinate with other Work is the responsibility of the Contractor.

3.2 TEMPORARY SERVICES

- A. Division 26 trades shall provide and maintain wiring for all interior construction lighting and power to meet OSHA standards. Division 26 Trade shall provide and maintain all required lamps and guards. Contractor's power tools, cords,

etc. shall be in strict accordance with the National Electric Code 2023 Article 590.

3.3 POWER OUTAGES

- A. No power outages shall be permitted on existing systems except at the time and interval specified by the Owner/Engineer. The Owner may require written approval, any outage must be scheduled when the interruption causes the least interference with normal schedules and business routines. NO extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. The Contractor shall provide a detailed outage plan and conduct outage planning meetings with the Owner/Engineer in preparation for the outage.
- C. The Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

3.3 RECORD DRAWINGS

- A. The Electrical Contractor shall furnish as-constructed drawings, including all Addendums, Bulletins and associated Field Directed changes included as part of the record drawings.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 19 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Building wire and cable.
- B. Service entrance cable.
- C. MC cable

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Conductor sizes are based on copper.
- C. Routing shown on Drawings is approximate unless dimensioned. Field route as required to best suit Project Conditions.
- D. Where wire and cable routing is not shown, and only a load destination is shown, determine exact routing and lengths required.

1.5 COORDINATION

- A. Coordinate Work under provisions of Division 1.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THW, THHN/THWN, XHHW-2.

2.2 MC CABLE

- A. Factory assembled multiple insulated conductors enclosed in armor of interlocking metal corrugated sheath.
- B. Provide all clips and supports.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use stranded conductors for control circuits.
- C. Use conductor size not smaller than 12 AWG for power and lighting circuits.
- D. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.
- E. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- F. Pull all conductors into raceway at same time.
- G. Protect exposed cable from damage.

- H. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.
- I. Use suitable cable fittings and connectors.
- J. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- K. Clean conductor surfaces before installing lugs and connectors.
- L. Splices are not permitted.
- M. All power wiring shall be installed in conduit. Low-voltage wiring shall utilize the channel trays-hooks or free-air method, or other cable management methods that meet industry standards as noted on the drawings. Conduit drops for fire alarm devices, card readers, power assisted doors, and voice/data outlets shall be required. Electrical Trades shall be responsible for coordinating with the Owner's low-voltage system and drawings for required raceway. Low voltage cables installed in accessible ceiling space need not to be in conduit. However, the cables must be properly secured to the ceiling structure.
- N. Refer to Section 26 09 23 for Occupancy Sensors wiring.
- O. If the Electrical Trades Contractor elects, at their option, to combine homerun circuits installed in a single conduit, the derating 2023 NEC 310.15(b) Table must be utilized for allowable conductor ampacity values. If the derating method is utilized, then furnish and install properly derated cables and properly sized conduits to meet Code. Electrical Trades Contractor shall be responsible to obtain inspection from the Electrical Inspector and pay all supplemental inspection and/or requested plan review fees.
- P. NEC Section 695 requires fire pump controller conductors to be protected and isolated. As noted, shown and specified, use fire rated cable or concrete encased conductor to meet Code requirements.
- Q. NEC Article 700 requires fire protection for Emergency System feeders. Provide feeders with a 2-hour fire rating to meet Code requirements.
- R. Shared neutrals for lighting and power circuits are not permitted.
- S. MC cable shall only be acceptable as the final connection to light fixtures installed in accessible ceilings. Maximum cable shall not exceed 6 feet. MC cable shall not be used for homeruns or feeders.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable under provisions of Section 26 05 53.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.4 FIELD QUALITY CONTROL

- A. Perform field inspection and testing to assure proper operation.

- B. Inspect wire and cable for physical damage and proper connection.
- C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- D. Verify continuity of each branch circuit conductor.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.
- D. Building foundation grounding.
- E. Earth ground resistance.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 PERFORMANCE REQUIREMENTS

- A. Resistance: Meet the NEC Code requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

- A. Material: Copper-clad steel or copper-weld type.
- B. Diameter: as scheduled on the drawings.
- C. Length: as scheduled on the drawings.

2.2 MECHANICAL CONNECTORS

- A. As scheduled on the drawings.

2.3 EXOTHERMIC CONNECTIONS

- A. As scheduled on the drawings.

2.4 WIRE

- A. Material: As scheduled on the drawings.
- B. Foundation Electrodes: Size to meet NFPA 70 requirements.
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site soil conditions before driving rod electrodes.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Provide bonding to meet Regulatory Requirements.
- D. Provide supplemental and service entrance grounding in accordance with 2023 NEC Section 250. Refer to Table 250-66
- E. Equipment Grounding Conductor: Provide a separate grounding conductor for lighting and power circuits as noted or specified on the drawings.
- F. Bond the paralleled service entrance conduits in accordance with NEC 2023 Section 310.10 requirements.
- G. In the case of an isolation ground system, the metal raceway may be used as the equipment ground and an insulated grounding conductor as the isolated ground. If PVC conduit is utilized, then two insulated grounding conductors shall be installed.
- H. Complete the grounding conductor to the building foundation rebar in accordance with 2023 NEC 250-52 (3) requirements.

- I. As shown and noted on the drawings, provide ground conductor from the new addition's foundation rebar back to the building's main distribution panel service ground bar. Provide minimum #6 grounding conductor from the main electric distribution equipment to the data racks.
- J. Provide a ground mat for the utility transformer as noted and shown on the drawings.
- K. Provide a grounding electrode and conductor for the pad mounted emergency generator as shown and noted on the drawings.
- L. Bond the cable tray or wire mesh tray as noted on the drawings.

3.3 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

3.4 EARTH GROUND RESISTANCE

- A. Use a meter that is suitable to tests 3 and 4 pole fall of potential with and without stakes. The meter shall measure ground loop resistances using only clamps, one stake, or one clamp and stakes. The stake-less test method shall measure earth ground loop resistances for multi-grounded system using only current clamps.
- B. The meter shall be capable of reading out which stakes or clamps to connect for each test. The resistance measurement shall calculate at 55 hz. Meter shall include automatic frequency control to identify existing interferences.
- C. Basic ground resistance measurements as applicable:
 - 3 pole
 - 4 pole
 - Stake-less ground loop
 - 3 pole with current clamp
 - 4 pole with current clamp
- D. Measuring principle: current/voltage measurement methods for the resistance methods listed above.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use expansion anchors.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.

5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Attachments of electrical equipment to structural members are the responsibility of the installing trade. Structural members shall not be field cut, welded or otherwise modified without approval of the Architect/Engineer. Attachment to steel joist shall be made at panel points whenever possible. Structural members shall not be overloaded as a result of attachments. Attachment/equipment loading for all trades resulting in total load greater than an equivalent uniform 5 psf for any member shall be submitted to the Architect/Engineer for review. Electrical Trades are still responsible for design, layout, and fabrication and installation of electrical supports and support attachment methods. Electrical Trades shall submit attachment methods to the Structural Engineer for review.
- B. Install products in accordance with manufacturer's instructions.
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use spring steel clips and clamps.
- E. Do not use powder-actuated anchors.
- F. Do not drill or cut structural members without permission from Architect/Engineer.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- J. No drilling of laminated wood beams without structural engineer review.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible non-metallic conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Electrical nonmetallic tubing.
- G. Flexible nonmetallic conduit.
- H. Fittings and conduit bodies.
- I. Surface raceway assembly.
- J. MC Cable.
- K. Fire rated wireway.
- L. Flexible metal conduit.
- M. Fire pump controller conduit.
- N. HDPE conduit.
- O. Conduit water sealant.
- P. Conduit seals (foundation walls).

1.2 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

1.3 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI C80.3 - Rigid Aluminum Conduit.
- D. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- E. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- H. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.8 PROJECT CONDITIONS

- A. Verify routing and termination locations of conduit prior to rough-in.
- B. Conduit routing shown is diagrammatic, field route conduit to avoid interferences.

1.9 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

- A. Minimum Size: $\frac{3}{4}$ inch unless otherwise specified.
- B. Underground Installations:
 - 1. Use Schedule 40 PVC conduit for general underground installation.
 - 2. Use Schedule 80 PVC conduit for heavy traffic areas.
 - 3. Use direct burial seamless HDPE as noted and shown on the drawings for underground installation.
- C. Outdoor Locations, Above Grade: Use rigid steel conduit.
- D. Wet and Damp Locations: Use rigid conduit or liquid-tight non-metallic flexible conduit.
- E. Dry Locations:
 - 1. Concealed: Use electrical metallic tubing.
 - 2. Exposed: Use electrical metallic tubing.
 - 3. Use minimum $\frac{3}{4}$ " conduit for TV outlet and fire alarm drops.
 - 4. Use flexible metal conduit for final wiring connections to motors, VFD units, light fixtures in accessible ceiling and interior transformers.
 - 5. Use minimum 1" conduit for voice/data wiring.
 - 6. Use minimum $1\frac{1}{4}$ " conduit for ceiling projectors.

2.2 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: ANSI C80.5.
- C. Intermediate Metal Conduit (IMC): Rigid Steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.4 LIQUID-TIGHT NON-METALLIC FLEXIBLE METAL CONDUIT

A. Description: Type NM. Manufacturer with a spiral of rigid PVC embedded reinforcement with a flexible PVC wall.

B. Compatible fittings.

C. Use for wet or exterior location as final wiring connections to motors or electrical equipment, etc.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw type.

2.6 NONMETALLIC CONDUIT

C. Description: NEMA TC 2; Schedule 40 PVC.

D. Fittings and Conduit Bodies: NEMA TC 3.

2.7 SURFACE RACEWAY ASSEMBLY

A. One steel raceway as scheduled or noted on the drawings.

B. Divided non-metallic raceway basic components

1. Base cover
2. Flat elbow
3. Divided entrance fitting
4. Blank end fitting
5. Dividers
6. Fill-in covers
7. 2 gang horizontal device bracket

2.8 FIRE RATED WIREWAY

A. As scheduled on the drawings.

B. Wireway sizes and quantities shall be based on the cable counts as determined by the Contractor.

2.9 MC CABLE

A. Corrugated steel tubing with integral conductors.

B. Use MC cable as noted on the drawings and specified in Low Voltage Electrical Power Conductors & Cables Specification 26 05 19.

- C. MC cable is not permitted for homeruns or feeders or branch device drops.

2.10 FIRE PUMP CONTROLLER CONDUIT

- A. Meet the current National Electric Code Edition Section 695 requirements for the incoming power feeder conduit serving the fire pump controller. Rated cables type RHH installed in metal conduit or THHN/TWHN cables installed in metal conduit that is concrete encased are acceptable methods.

2.11 HDPE CONDUIT

- A. Smooth seamless for direct burial application.
- B. PVC cement is not acceptable for HDPE to PVC connection. Acceptable conduit adhesive shall be "Bonduit" offered by Polywater or approved equal.
- C. Use HDPE conduit couplers for transition to interduct, PVC or threaded steel conduit. Provide "E-loc" or electrofusion coupler type manufactured by Lamson Pipe Company or approved equal by Shur-Lock couplers by Arnco Corporation.
- D. Refer to NEC 2023 Section 353 for the HDPE conduit connection and installation methods.
- E. HDPE conduit is not acceptable for exposed installations.

2.12 WATER SEALANT

- A. Use "Polywater FST" for a means and methods to seal leaking conduits. Follow the manufacturer's instructions.

2.13 CONDUIT SEALS (FOUNDATION WALLS)

- A. Modular elastomer type. EDM seal element. Nylon reinforcement. Pressure plate zinc plated bolts and nuts. Follow manufacturer's sizing chart and installation manual. Eaton Link Seal or equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install nonmetallic conduit in accordance with manufacturer's instructions.
- B. Arrange supports to prevent misalignment during wiring installation.
- C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- E. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.

- F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- G. Do not attach conduit to ceiling support wires.
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. Route conduit parallel and perpendicular to walls or building centerlines.
- J. Route conduit installed above accessible ceilings parallel and perpendicular to walls. Install metal conduit sleeves or fire rated assembly in all fire rated wall as identified on the electrical or architectural life safety plans.
- K. Route conduit in and under slab from point-to-point.
- L. Do not cross conduits in slab.
- M. Maintain adequate clearance between conduit and piping.
- N. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- O. Cut conduit square using saw or pipecutter; de-burr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- R. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- S. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
- T. Provide suitable fittings to accommodate expansion and deflection where conduit crosses, control and expansion joints. Use a UL listed expansion joint. If expansion length exceeds the manufactured expansion fitting, the use of PVC coated metallic flexible conduit is an acceptable method.
- U. Provide suitable pull wire in each empty conduit except sleeves and nipples.
- V. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- W. Ground and bond conduit under provisions of Section 26 05 26.
- X. Identify conduit under provisions of Section 26 05 53.
- Y. Firestop the conduits passing thru fire rated walls. Electrical Contractor shall be responsible to review the Architectural Life Safety drawings for fire rated wall locations.

- Z. The control system contractor shall be responsible to adhere to the mechanical plans and/or temperature control system drawings to establish conduit routes.
- AA. Electrical Contractor shall be required to install new conduit (concealed) in all finished areas for the following, but not limited to: exit lights, clocks, light fixtures, receptacles, sensors, switching, fire alarm manual pull stations, horn/strobe unit and strobe units, etc. Saw cut, channel and patch the walls. Neatly saw cut all existing brick veneer, glazed block or tiled areas to complete the new work. Firestop all conduits passing through fire rated walls, floors or separation barriers. Take the necessary steps to prevent chipping during the saw cutting and or wall channeling operation in the brick veneer, glazed tile or block areas. It shall be acceptable to install conduit from the opposite wall side to minimize brick veneer, glaze block or tile work. In non-finished spaces such as janitor closets, mechanical rooms, hub rooms, electrical rooms and storage rooms, conduit can be surface mounted. Provide flush mounted device boxes in all new wall construction as shown on the architectural drawings. Conduit drops or MC cable shall be concealed in the new walls and as noted and specified on the drawings.
- BB. All power, voice, clock, public address, data, fire alarm, occupancy sensor lighting wiring installed in exposed spaces shall be installed in conduit.
- CC. Electrical Contractor shall install the non-metallic divided surface raceway as noted or shown on the drawings. Refer to Electrical plans for a typical raceway detail.
- DD. Low-voltage voice and data device conduit drops shall only be required to be extended into the accessible ceiling space or to a cable tray as noted or specified on the drawings.
- EE. Contractor shall provide separate raceway for the emergency power distribution system.
- FF. Electrical Contractor shall identify emergency power. Identify all of the junction box cover plates with panelboard source ID and circuit number(s). Provide engraved label. Handwritten on the junction box cover plate is not acceptable.
- GG. Provide conduit wall sleeves for low-voltage wiring installation as shown and noted on the drawings. Firestop the conduit openings. Use fire rated wireway as specified or noted on the drawings.
- HH. Multiple non-metallic conduit duct bank shall include top, intermediate and bottom PVC conduit spacers spaced on 60" centers.
- II. Provide empty conduit for power assisted doors as noted and shown on the drawings.
- JJ. Provide empty conduit for security system as noted and shown on the drawings.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods consistent with facility standards or this project specification. Contractor is responsible to review the Architectural drawings to determine fire rated locations.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket or detail to match roof type specified.
- C. No drilling of the existing gym laminated beams is permitted without a review with the project Structural Engineer.

END OF SECTION

MAI: 2021-1551

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.
- D. Fire alarm device boxes.
- E. Public address speaker backbox assembly.
- F. Clock boxes.
- G. TV outlet.
- H. Voice/data boxes.
- I. Occupancy sensor boxes.
- J. Receptacle elevator service pit box.
- K. Power assisted door boxes.
- L. Security system boxes.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 BRANCH DEVICE BOXES

- A. Sheet Metal Outlet Boxes: Use 4" square stamped steel box with single gang device ring as general project requirement.
- B. Nonmetallic Outlet Boxes: NEMA OS 2. (Not permitted unless as noted on the drawing).
- C. Cast Aluminum Boxes: for exterior location use a single gang shallow box with thread hub connection. Provide gasketed cover by box manufacturer.
- D. Use masonry box in masonry walls.
- E. Use 4" octagon box for ceiling smoke detectors.
- F. Use in line non-metallic type box in non-metal surface raceway assembly as scheduled and detailed on the drawings.
- G. Elevator service pit box for the receptacle shall be NEMA 4 to meet State Elevator Code.

2.2 FLOOR BOXES

- A. As scheduled on the drawing.

2.3 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes
 - 1. NEMA 1 enclosure for interior location.
 - 2. NEMA 3R or 4X for exterior location.
 - 3. Stainless steel for food service area.
 - 4. Non-metallic pull and junction boxes are not permitted for this project unless noted otherwise.

2.4 OCCUPANCY SENSORS

- A. Refer to the manufacturer for box requirements.

2.5 PUBLIC ADDRESS AND TELEVISION DISTRIBUTION SYSTEM

- A. Refer to Sections 26 06 50 and 27 13 33.

2.6 VOICE AND DATA BOXES

- A. Use 4 11/16" square stamped steel box with a single gang device.

2.7 POWER ASSISTED DOOR BOXES

- A. Provide 4" square box for palm button backbox for use by the installing vendor.

2.8 SECURITY BOXES

- A. Provide empty 4" square boxes as noted and shown on the drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in locations as shown on Drawings, and as required for wire pulling, equipment connections and compliance with regulatory requirements.
- B. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
- D. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- E. Maintain headroom and present neat mechanical appearance.
- F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- H. Install boxes to preserve fire resistance rating of partitions and other elements.
- I. Coordinate mounting heights and locations of outlets for counters, backsplashes, benches in casework and workstations.
- J. Locate outlet boxes to allow luminaires positioned as shown.
- K. Align adjacent wall mounted outlet boxes for switches, etc.
- L. Use flush mounting outlet box in finished areas. Surface mounted boxes are acceptable for non-finished spaces.
- M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

- N. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- O. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- P. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- Q. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- R. Use adjustable steel channel fasteners for hung ceiling outlet box.
- S. Do not fasten boxes to ceiling support wires.
- T. Support boxes independently of conduit.
- U. Use gang box where more than one device is mounted together. Do not use sectional box.
- V. Use gang box with plaster ring for single device outlets.
- W. Install floor boxes flush with the finished floor.
- X. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations. Set floor boxes level.
- Y. Install in line boxes in the surface mounted raceway system as shown on the drawing.
- Z. Large Pull Boxes: Provide screwed cover or hinged enclosure in interior dry locations as noted or specified on the drawing.
- AA. Junction box cover plates installed above the ceiling shall be facing down.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under other sections.
- B. Refer to Section 28 31 00 for fire alarm mounting height.
- C. Install public address speaker backbox at locations noted or shown on the drawings. Confirm final ceiling location to avoid the interferences with light fixtures, fire alarm and HVAC diffusers.

3.3 ADJUSTING

- A. Adjust floor box flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

New Structure and Facility For
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

END OF SECTION

MAI: 2021-1551

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Labeling methods and standards.
- E. Conductor color coding and identification.
- F. Panelboard directory.
- G. Underground warning tape.
- H. Arc flash warning labels.
- I. Electrical distribution equipment.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 NAMEPLATES AND LABELS

- A. Nameplates:
 - 1. Engraved three-layer laminated plastic, black letters on white background for normal power.
 - 2. Emergency power panels and associated equipment shall be white letters on red.
- B. Locations:
 - 1. Each electrical distribution panelboard, switchboard and power panel.
 - 2. Each starter.
 - 3. Each disconnect.
 - 4. Automatic transfer switches.
 - 5. Emergency circuit junction box cover plates.
 - 6. MDF/IDF patch panel ports.
 - 7. Voice/data outlets.
 - 8. Each VFD.
 - 9. Boiler e-stop station.
- C. Nameplate size minimum 1"x3" or match existing.

2.2 WIRE MARKERS

- A. Manufacturers:
 - 1. Brady or equal.
- B. Description: Tape type wire markers.
- C. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
- D. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
 - 2. Control Circuits: Control wire numbers.

2.3 CONDUIT MARKERS

- A. Emergency raceway or specialty systems.
- B. Location: Furnish stencil or painted stripe for each conduit longer than 10 feet. Stencil painted stripe shall not be less than 10" long (i.e. red or black).
- C. Spacing: 20 feet on center.
- D. Color:
 - 1. 120, 208 or 480 Volt Normal Power System: Black.
 - 2. 120, 208 or 480 Volt Emergency Power Supply: Red.
- E. Legend:
 - 1. Normal Power Supply Panel Feeder: Indicate panel being fed and from where. (LPM fed from DP4)
 - 2. Emergency Power Supply Panel Feeder: Emergency Power Supply LS, CB, EB respectively. (i.e. LSIA, CBIC, EBDP)

2.4 LABELING METHODS AND STANDARDS

A. Engraved Labels

1. All electrical panels, starters, disconnect switches, terminal cabinets, fire alarm panel, nurse call system cabinet, personnel patient TV system cabinet or similar central system cabinet shall be permanently identified using engraved labels. These labels shall be secured with double face tape or mechanically fastened in applications where the tape may have a tendency to fail.
2. Normal power fed systems shall have white labels with black lettering. Emergency power fed systems shall have red labels with white lettering.
3. Lettering sizes may vary due to space constraints or to distinguish between main versus branch systems. Sizes should be consistent throughout the project, use the following guidelines:

Switchboard or Panelboard Main Label:	1" high minimum
Switchboard or Panelboard Branches	1/2" high minimum
Starters, Disconnects, VFDs, Boiler e-stop station	1/2" high minimum
Manual Motor Starters	1/4" high minimum

4. All labels shall identify where panel or equipment is fed from. Ex (panel A fed from MDP)

B. Adhesive Tape Labels

1. Receptacles shall have the circuit number identified on the device cover plate using clear adhesive tape labels with 1/4" high printed block characters in black.
2. Provide circuit identification on junction or pull box covers for all circuits within.
3. Conductors in branch circuit panelboards shall have phase conductors, neutrals and grounds identified with adhesive labels within the panel at junction or pull boxes and at the device outlet box. Refer also to conductor color coding with respect to operating voltage.

2.5 CONDUCTOR COLOR CODING AND IDENTIFICATION

- A. Feeder phase conductors shall be identified as to phase and operating voltage using colored tape as follows:

	<u>480 Volt</u>	<u>120/208 Volt</u>
Phase A	yellow	black
Phase B	brown	red
Phase C	orange	blue
Neutral	gray	white

Ground

green

green

- B. Conductors from #18 up through #10 shall have colored insulating jackets to match the color code and phasing scheme as described above for feeders. Receptacle and lighting circuit conductors shall be #12 minimum for 15 or 20 amp circuits. Conductors #18 through #14 shall only be used for control circuits with colored jackets and wire numbers correlated to each system accordingly.
- C. Spare conductors shall be clearly identified as such through color, labels, tags, etc.

2.6 PANELBOARD DIRECTORY

- A. Provide typed directory. Handwritten is not acceptable.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to inside surface of door on panelboard.
- C. Contractor shall review the drawings to confirm all label schemes or ID requirements listed or noted on the drawings. Review mechanical drawings for equipment ID designation to provide a ID tag that corresponds to the mechanical equipment.
- D. Provide arc flash generic warning label on all electrical distribution equipment in accordance with NEC 2017 requirements. Provide PPE arc flash warning labels as specified with arc flash/short circuit coordination study.
- E. Panelboard, switchboards, transformers, etc. shall include their source of power included in nameplate label. (i.e. LPA feed from PP2)

END OF SECTION

MAI: 2021-1551

SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mechanical equipment.
- B. Occupancy sensor equipment.
- C. Owner furnish equipment.
- D. Blank feed thru GFI
- E. Boiler Disconnect
- F. Boiler e-Station

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 COORDINATION

- A. Coordinate work under provisions of Division 1.
- B. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- E. Sequence electrical connections to coordinate with start-up schedule for equipment.

- F. Mechanical Trades shall be responsible to furnish and install all temperature control components, associated conduit, wiring and 120 volt power supplies. Electrical Trades shall reserve 120 volt circuit breaker as scheduled in the panels for this purpose.
- G. All VFD programming shall be completed as part of the Mechanical Trades work.
- H. Where equipment will cover a GFI outlet within 6 feet of sink, provide a blank feed thru GFI test station.
- I. Boiler emergency stop station shall disconnect main power to the boiler(s).

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

- A. Manufacturers:
 - 1. Hubbell, Pass & Seymour, Leviton or equal.
- B. Attachment Plug Construction: Conform to NEMA WD 1.
- C. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: ANSI/NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit over current protection.

2.2 BOILER DISCONNECT SWITCH

- A. Lockable type to meet ASME-1 2023 Standard.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of Division 1.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using metallic flexible conduit for all dry interior locations. Use liquid tight non-metallic flexible conduit with watertight connectors in damp or wet locations and kitchen areas.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide the NEMA configuration that matches receptacle.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, power relays, motor starters and contactors as noted on the drawings.
- G. Provide and install fuses in mechanical trades furnished fused disconnects and combination starters per manufacturer's requirements.
- H. Electrical Contractor shall install mechanical furnished motor speed control and as required to control motor speed.
- I. Complete all lighting controls as scheduled, noted and shown on the drawings.
- J. Electrical Contractor shall complete all main power wiring to the mechanical equipment shown and noted.
- K. VFD control wiring and programming shall be completed as part of the Mechanical Trades bid. VFD shall be factory installed with the equipment unless noted or specified otherwise.

3.3 BLANK FEED THRU GFI

- A. Install a remote blank feed thru GFI where a refrigerator, freezer or other equipment that blocks access to the receptacle located within 6 feet of a sink.

3.4 BOILER LOCKABLE DISCONNECT INSTALLATION

- A. Lockable disconnect shall be installed within 5 feet of any side of the boiler it is serving. Lockable disconnect location shall not interfere with the boiler service clearances.

3.5 BOILER E-STOP

- A. Install at the boiler room main entry door.

END OF SECTION

MAI: 2021-1551

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Power packs.
- B. Occupancy sensor.
- C. Relay panels.
- D. Low voltage push button stations.
- E. CAT 5E wiring.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. ASHRAE 90.1 2013 Energy Code.
- B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.
- C. 2015 Michigan Energy Code.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Occupancy sensor cut sheets, control panel layouts, wiring connections, diagrams, and dimensions. Cut sheets shall either be marked or arrowed components with catalog numbers. Failure to comply will be cause to return the submittals for corrections at no delays or extra costs to the Owner.

1.5 REGULATORY REQUIREMENTS

- A. ASHRAE 90.1 2013.
- B. Conform to requirements of 2015 Michigan Building Code, 2017 National Electrical Code, 2017 State of Michigan Code Rules Part 8, 2009 ICC/ANSI 117.1 and local code requirements.

- C. Products: Furnish products listed or labeled to conform to requirements of 2017 National Electric Code, 2017 State of Michigan Electric Code Rules Part 8, and local authority having jurisdiction.
- D. 2015 Michigan Energy Code.
- E. 2015 Life Safety Code. NFPA 101. Chapter 7 – 7.8.1.2.2 Means of Egress Lighting.

PART 2 PRODUCTS

2.1 SYSTEM COMPLIANCE

- A. System components manufactured in accordance with UL 916 and UL 924 standards where applicable.
- B. System components manufactured in accordance with CFR Title 47, Part 15 standards where applicable.
- C. System components manufactured in accordance with ISED Canada RSS-247 standards where applicable.
- D. System components manufactured in accordance with IFT-008-2015 and NOM-208-SCFI-2016 standards where applicable.
- E. System listed as qualified under DesignLights Consortium Networked Lighting Control System Specification v5.0.
- F. Performance Criteria:
 - 1. Regulatory Requirements:
 - a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. System Architecture:
 - 1. System architecture based upon the following concepts:
 - a. Networkable intelligent lighting control devices.
 - b. Standalone lighting control zones using distributed intelligence.
 - c. Optional system backbone for remote, time-based, and global operation.
 - 2. Intelligent lighting control devices with individually addressable network communication capability and having one or more basic lighting control components including: occupancy sensor, photosensor, relay, dimming output, contact closure input, analog 0-10 V(dc) input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure permissible to minimize overall system device count.
 - 3. System capable of interfacing directly with networked luminaires such that either low-voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches, and system backbone.

4. Networked luminaires and intelligent lighting control devices support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices.
 5. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices capable of providing automatic control from sensors (occupancy and/or photosensor) and manual control from local wall stations without requiring connection to a higher-level system backbone.
 - a. Lighting control zones (wired and wireless) support at least 128 devices per zone.
 - b. Capable of being networked with a higher-level system backbone to provide time-based control, control from inputs or systems external to control zone, and remote configuration and monitoring through a software interface.
 6. Networked luminaires and intelligent lighting control devices with distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones operate according to their defined default settings and sequence of operations.
 7. System to include one or more system controllers that provide time-based control.
 8. System devices support firmware update, either remotely or from within the application space, for purposes of upgrading functionality at a later date.
 9. System capable of reporting lighting system events and performance data to management software for display and analysis.
- B. Wired Networked Control Zone Characteristics:
1. Connections to devices within a wired networked lighting control zone and to backbone components accomplished with a single type of low-voltage network cable, compliant with CAT5e specifications or higher. Use of mixed types of low-voltage network cables is unacceptable.
 2. Devices connected in "daisy-chain" topology. "Hub-and-spoke" topology, requiring all individual networked devices to be connected to a central component, is unacceptable, to reduce the total amount of network cable required for each control zone.
 4. Pre-terminated, plenum-rated, low-voltage network cabling supplied with hardware. Following proper installation and provision of power, all networked devices connected with low-voltage network cable must automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g. software application, handheld remote, pushbutton).
 - a. The "out of box" default sequence of operation is intended to provide typical sequence of operation to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
 5. System software capable of automatic discovery of all connected devices without requiring any provisioning of system or zone addresses.
 6. Networked devices capable of detecting improper communication wiring and LED notification to alert installation/startup personnel.
 7. Networked control devices suitable for control of egress or emergency light sources without additional, externally mounted UL 924 shunting or 0-

10 V(dc) disconnect devices, to provide a compliant sequence of operation

- while reducing the overall installation and wiring costs of the system. Capable of supporting the following sequence of operation:
- a. Low-Voltage Power Sensing: Devices automatically provide 100 percent light level upon detection of loss of power sensed via low-voltage network cable connection where applicable.
 - b. Line-Voltage Power Sensing: Devices listed as UL 924 emergency relays which automatically close load-control relay and provide 100 percent light output upon detection of loss of power sensed via line voltage connection to normal power.
8. Global Control Zones: Networked luminaires and intelligent lighting control devices located in different areas able to transmit and track information within at least 128 system-wide control zones to support required sequences of operation that may span multiple areas. Occupancy, photosensor inhibit, and switch commands available across multiple controllers.
9. Wired Networked Wall Station Scene-Control Capabilities:
- a. Preset Scenes that activate a specific combination of light levels across multiple local and global channels.
 - b. Local Profile Support: Profile Scenes that modify the sequence of operation for devices in the area (group) in response to a button press to dynamically optimize occupant experience and lighting energy usage.
 - 1) Wall stations able to manually start and stop local profiles, or local profile capable of ending after a specific duration of time between five minutes and 12 hours.
 - 2) Configurable Parameters:
 - a) Fixture light level.
 - b) Occupancy time delay.
 - c) Response to occupancy sensors (including enabling/disabling response).
 - d) Response to daylight sensors (including enabling/disabling response).
 - e) Enabling/disabling wall stations.
 - c. Three-Way or Multi-Way Control: Multiple wall stations capable of controlling the same local and global control zones, to support "multi-way" preset scene and profile scene control.

End of Section

MAI: 2021-1551

SECTION 26 21 00 - LOW VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Arrangement with Utility Company and Owner for permanent electric service.
- B. Underground service entrance.
- C. Metering equipment.
- D. Letter of authorization.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SYSTEM DESCRIPTION

- A. System Characteristics: As scheduled on the drawings.
- B. Service Entrance: As scheduled on the drawings.

1.5 PRE-INSTALLATION CONFERENCE

- A. Arrange with the Owner or Construction Manager to hold a job site meeting with the utility to overview the new service installation sequence and project schedules.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 UTILITY METERS

- A. Meters will be furnished by Utility Company.

2.2 UTILITY METER BASE

- A. Meter base will be furnished by Utility Company.

2.3 TRANSFORMER PAD

- A. Description: As detailed on the drawing.

2.4 SERVICE UPGRADE COSTS

- A. The Owner shall pay all service costs assessed directly by the utility.

2.5 LETTER OF AUTHORIZATION

- A. Owner shall provide a written document that grants permission to the Engineer/Architect to talk with the utility for electrical service.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

- A. Make arrangements with Utility Company to obtain permanent electric service to the project.
- B. Coordinate location of Utility Company's facilities to ensure proper access is available. Owner shall be responsible to prepare and submit letter of authorization as required by the utility.

3.3 INSTALLATION

- A. Install service entrance conduits as shown or noted on the drawings.
- B. Contractor shall work extended hours or weekends as required to complete the service entrance installation.
- C. All backfilling, grading, seeding shall be completed as part of the site contractor's bid upon completion of the utility's work.

END OF SECTION

MAI: 2021-1551

SECTION 26 22 00 - LOW VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Dry type two winding transformers.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.
- C. Department of Energy 2016 ruling 10 CFR Part 431 for transformer efficient levels.
- D. Transformer shall be UL listed or labeled to meet the requirements of 2023 National Electric Code, 2023 Michigan Electric Code Rules Part 8, and local authority having jurisdiction

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store, protect, and handle products to site.
- B. Deliver transformers individually wrapped for protection and mounted on shipping skids.
- C. Accept transformers on site. Inspect for damage.
- D. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- E. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

- A. Manufacturers:
 - 1. As scheduled on the drawings.
- B. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated.
- C. Insulation system and average winding temperature rise for rated kVA as follows:
 - 1. 1-15 kVA: Class 185 with 115 degrees C rise, and aluminum windings, DOE compliant.
 - 2. 16-500 kVA: Class 220 with 115 degrees C rise, and aluminum windings, DOE compliant.
- D. Case temperature: Do not exceed 40 degrees C rise above ambient at warmest point.
- E. Winding Taps:
 - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
 - 2. Transformers 15 kVA and Larger: NEMA ST 20.

- F. Sound Levels: NEMA ST 20. Maximum sound levels are as follows:
 - 1. 1-5 kVA: 40 dB.
 - 2. 6-25 kVA: 45 dB.
 - 3. 26-150 kVA: 50 dB.
 - 4. 151-225 kVA: 55 dB.
 - 5. 226-300 kVA: 55 dB.
 - 6. 301-500 kVA: 60 dB.
- G. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.
- H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- I. Mounting: Suitable for wall, floor, or trapeze mounting.
- J. Coil Conductors: Continuous windings with terminations brazed or welded.
- K. Isolate core and coil from enclosure using vibration-absorbing mounts.
- L. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are suitable for installing transformer supports.

3.2 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Set transformer plumb and level.
- C. Use flexible conduit, under the provisions of Section 26 05 33.13, for the final wiring connection to the transformer. Make conduit connections to side panel of enclosure.
- D. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure as noted or shown.
- E. Provide grounding and bonding in accordance with Section 26 05 26.
- F. Use a trapeze type transformer support or knee brace support unless noted otherwise.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed to assure proper operation.
- B. Check for damage and tight connections prior to energizing transformer.

- C. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

MAI: 2021-1551

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Distribution panelboards.
- B. Branch circuit panelboards.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers.
- B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- C. NEMA KS 1 - Enclosed Switches.
- D. NEMA PB 1 - Panelboards.
- E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- F. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
- D. Panelboard submittal shall match drawing schedule arrangement. Submittal shall custom edit schedules to match design drawings.

- E. Manufacturer and Contractor shall verify the overcurrent protective device to match wire size as shown and noted in the bid documents.

1.5 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, circuit breaker type or fusible switch type per plan.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- D. Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
- E. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1. Provide circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.
- F. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole.
- G. Provide circuit breaker accessory trip units and auxiliary switches as indicated.
- H. Cabinet Front: Surface type, fastened with concealed trim clamps, hinge and latch. Provide hinged door with flush lock. Finish in manufacturer's standard gray enamel.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. As scheduled on the drawings.

2.4 FUSES

- A. Manufacturers:
 - 1. Bussman, or equal.
- B. Fuses 600 Amperes and Less: Dual element, current limiting, time delay, one-time fuse, 600 volt.
- C. Fuses 601 Amperes and Larger: Current limiting, time delay one time fuse, 600 volt, UL Class L.
- D. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- E. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 5 empty 1 inch. Identify each as SPARE.
- G. Arc-fault protection is required on all 120 volt branch circuits supplying 15 amp and 20 amp receptacles installed in dwelling units.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed to assure proper operation.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

New Structure and Facility For
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

MAI: 2021-1551

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates.
- D. Boiler Room emergency stop station.
- E. Tamper resistant receptacles.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 1 - General Requirements for Wiring Devices.
- B. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- D. ADA - Americans with Disabilities Act - As amended.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Pass & Seymour, Hubbell, Leviton or equal.

- B. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
- C. Body and Handle: Color to be determined from standard colors by the Architect.
- D. Ratings:
 - 1. Voltage: 120/277 volts, AC.
 - 2. Current: 20 amperes.
- E. Boiler Emergency Power Off
 - 1. Provide EPO station as scheduled on the drawings.

2.2 WALL DIMMERS

- A. Manufacturers:
 - 1. As scheduled on the drawings.

2.3 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell, Pass & Seymour, Leviton, or equal
- B. Description: NEMA WD 1, Heavy-duty specification grade duplex receptacle.
- C. Device Body: Color to be determined from standard colors by the Architect.
- D. Configuration: NEMA WD 6, type as specified and indicated.
- E. Convenience Receptacle: Type 5-20.
- F. Emergency receptacles shall be red with matching cover plate and shall be provided with LED power indicating light.
- G. GFCI Receptacle: Convenience duplex receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- H. Damp and wet location receptacles shall be rated "WR".
- I. Isolated Ground Receptacle.
 - 1. Use the orange embossed triangle type device body for all finished spaces.
 - 2. Orange device body is acceptable for non-finished spaces.
- J. Tamper Resistant Receptacles
 - 1. All 15 amp and 20 amp receptacles shall be listed tamper resistant as follows:
 - Dwelling units.
 - Guest rooms.
 - Child care facilities.
 - Preschools and elementary education facilities.
 - Business offices, corridors, waiting rooms, and the like in clinics, medical and dental offices, and outpatient facilities.
 - Assembly occupancies, including gyms, skating rinks, and auditoriums.

2.4 WALL PLATES

- A. Cover Plate: Color to be determined from standard colors by the Architect.
- B. Use stainless steel cover for food service areas, and healthcare facilities.
- C. Use "in use" weather proof metallic covers at exterior locations as indicated on the drawings to meet 2023 NEC Section 406.
- D. Provide blank metal cover plates on abandoned boxes.
- E. Provide stamped metal cover plate for unfinished spaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that floor boxes are adjusted properly.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Install receptacles with grounding pole on bottom.
- D. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor where specified.
- E. Install plates on switch, receptacle, and blank outlets in finished areas.
- F. Connect wiring devices by wrapping conductor around screw terminal.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

- H. Install protective rings on active flush cover service fittings.
- I. Shared neutral are not permitted for lighting and power circuits.
- J. Install the boiler emergency shutdown switch at each main boiler room area entrance.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Confirm with architectural drawings for counter casework, etc. details for wiring devices mounting heights.
- B. Install wall switch 48 inches to top of box above finished floor.
- C. Install convenience receptacle 16 inches to bottom of box above finished floor.
- D. Install convenience receptacle 6 inches above backsplash of counter.
- E. Install dimmer 48 inches to top of box above finished floor.
- F. 18" mounting height is lieu of the 16" minimum specified is acceptable pending masonry course lines.
- G. Electrical Trades shall review 2017 ICC/ANSI A117.1 for ADA requirements. Obtain a copy as required.
- H. Refer to all other sections of the specification, drawings, and Architectural drawing for specific mounting requirements for clocks, receptacles shown in counters, work stations. Do not rely solely on the electrical drawings for this information. Division 26, 27 & 28 Contractor shall be responsible to review all project documentation and obtain all required information from the district.
- I. Refer to section 28 31 00 and drawing notes for fire alarm device mounting heights.

3.5 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

New Structure and Facility For:
Port Austin Four Seasons Pavilion
Port Austin, Michigan

PROJECT NO. 2021120

END OF SECTION

MAI: 2021-1551

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.
- C. Fuses.

1.2 REFERENCES

- A. NEMA KS 1 - Enclosed Switches.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E - Class R Fuses.

1.3 SUBMITTALS

- A. Provide submittal as listed in Section 26 01 00.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. As scheduled on the drawings.

2.2 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
- B. Nonfusible Switch Assemblies: NEMA KS 1, Type Heavy Duty load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: NEMA KS 1.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

2.3 FUSES

- A. Manufacturers:
 - 1. Bussman or equal.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches where indicated.
- B. Install fuses in fusible disconnect switches.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- D. Electrical Contractor shall be responsible to review the mechanical equipment schedules to determine if any factory installed switches are scheduled and noted as part of the equipment to minimize duplication by electrical trades.
- E. Furnish and install a lockable fusible disconnect switch for each boiler main incoming power disconnecting means to meet the State's Boiler Code Division requirements.

END OF SECTION

MAI: 2024-1551

SECTION 26 29 34 - ENCLOSED CONTACTOR

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General purpose contactor.

1.2 REFERENCES

- A. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- C. 2017 National Electrical Code.

1.3 SUBMITTALS

- A. Submit as listed in Section 26 01 00.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Contactor as scheduled on the drawing.

2.2 CONTACTOR

- A. Coil Voltage: As scheduled on the drawing.
- B. Poles: As scheduled on the drawing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

END OF SECTION

MAI: 2024-1551

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior luminaires per schedule.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
- B. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- C. NFPA 101 - Life Safety Code, current adopted edition.
- D. 2015 Michigan Energy Code.
- E. ASHRAE 90.1 2013 Edition.
- F. LED Standards LM 79 and LM 80.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Conform to requirements of NFPA 101.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

- D. 2015 Michigan Energy Code.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Furnish Products as scheduled on the drawings.

2.2 LED DRIVERS

- A. LED drivers shall include a factory disconnecting means in accordance with 2023 NEC 410-130G.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Support luminaires independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Exposed Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips at a minimum of (4) points of attachment to prevent movement.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in place at a minimum of (4) points of attachment to prevent movement.
- I. Install wall mounted luminaires at height as indicated on Drawings and/or architectural drawings.
- J. Install accessories furnished with each luminaire.
- K. Connect emergency luminaires to the emergency distribution or inverter as noted and shown on the drawings.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- M. Bond products and metal accessories to branch circuit equipment grounding conductor.

- N. Luminaires specified with factory installed battery drivers shall be wired as noted and shown on the drawings.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 ADJUSTING

- A. Contract Closeout: Division 1: Adjusting installed work.
- B. Aim and adjust luminaires as indicated or as directed.

3.4 CLEANING

- A. Contract Closeout: Cleaning installed work.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 DEMONSTRATION AND INSTRUCTIONS

- A. Replace light fixtures with non-working LED's, broken or discolored lens.

3.6 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protecting installed work.

3.7 SCHEDULES

- A. Refer to Drawings.

END OF SECTION

MAI: 2021-1551

SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Exterior luminaires and accessories.
- B. Watertight wiring connectors.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. LED Standards LM 79 and LM 80.
- B. ANSI O5.1 - Specifications and Dimensions for Wood Poles.
- C. IES 10th Edition.
- D. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- E. 2015 Michigan Energy Code.

1.4 SUBMITTALS FOR REVIEW

- A. Provide submittal as listed in Section 26 01 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire which is not a standard Product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.

1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Michigan Uniform Energy Code.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Material and Equipment: Transport, handle, store, and protect products.
- B. Store and handle solid wood poles in accordance with ANSI O5.1.

1.7 COORDINATION

- A. Coordination, refer to Division 1.
- B. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

PART 2 PRODUCTS

2.1 LUMINAIRES AND ACCESSORIES

- A. Furnish Products as scheduled on the drawings.

2.2 WATERTIGHT WIRING CONNECTORS.

- A. Furnish removal connector assembly either fused or non-fused.
- B. Provide in-line connector type for single circuit application.
- C. Provide Y type connector to permit splitting of the circuit.
- D. Acceptable manufacturers for in line or y connectors: Buchanan 84, 65 Series or equal by Homac.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Anchor bolts and templates shall be furnished by the manufacturer. Setting of the anchor bolts shall be the contractor's responsibility for a properly positioned pole/fixture assembly to be perpendicular to the curb or walkway edge.
- B. Bond luminaires to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
- B. Measure illumination levels to verify conformance with performance requirements.
- C. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.3 ADJUSTING

- A. Contract Closeout: Adjusting installed work, refer to Division 1.
- B. Aim and adjust luminaires to provide illumination levels and distribution as specified.

3.4 CLEANING

- A. Contract Closeout: Cleaning installed work, refer to Division 1.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.5 PROTECTION OF FINISHED WORK

- A. Contract Closeout: Protecting installed work, refer to Division 1.
- B. Repair luminaires which have failed lamps at Substantial Completion.

3.6 SCHEDULE

- A. Refer to drawings.

END OF SECTION

MAI: 2021-1551

SECTION 27 05 28 - PATHWAYS FOR COMMUNICATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Voice/Data raceway.

1.2 RELATED SECTIONS

- A. All drawings and specification sections apply to work in this section. Furnish all items, articles, materials, equipment, operations or methods that are mentioned, listed or scheduled on drawings or are in this specification including all labor, equipment, materials and miscellaneous incidentals necessary and/or required for the completion of this project. The work covered under this section of the specifications is in no way complete within itself but is supplementary to the entire specification and drawings.

1.3 REFERENCES

- A. EIA/TIA-568 - Commercial Building Wiring Standard.
- B. EIA/TIA-569 - Commercial Building Standard for Telecommunication Pathways and Spaces.
- C. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.

1.4 SYSTEM DESCRIPTION

- A. Data wiring: By Owner.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 1.
- B. Record actual locations and sizes of pathways and outlets.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of 2015 Michigan Building Code, 2023 National Electrical Code, 2023 Michigan Electrical Code Rules Part 8, 2017 ICC/ANSI A117.1 and local code requirements.
- B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

Section Not Used

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install raceways in accordance with EIA/TIA 568.
- B. Support raceways and cabinets under the provisions of Section 26 05 29.
- C. Cabinets to be installed by owner. Electrical contractor shall stub conduits to accessible location above ceiling at each location as indicated on the drawings.
- D. Install polyethylene pulling string in each empty voice conduit over ten feet in length or containing a bend.
- E. Install a #6 AWG green ground wire to backboard from service entrance ground bar in main panel.
- F. Data outlet minimum mounting heights shall match duplex receptacles. Refer to Section 26 06 24.

END OF SECTION

MAI: 2021-1551

SECTION 31 10 01
CLEARING AND REMOVAL OF MISCELLANEOUS STRUCTURES

PART 1 - GENERAL

1.01 Work Included

This work includes, but is not limited to, clearing, topsoil removal, tree and stump removal, and the removal and protection of miscellaneous items within the project area.

1.02 Related Work

A. Section 02 41 13.13 – Pavement Removal

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 Location of Underground Utilities

The Contractor shall call MISS DIG at least three work days before excavating in an area so that utility companies can identify their buried utilities. The Contractor shall notify area municipalities and other utilities in the area that do not participate in the MISS DIG program for location of their utilities.

3.02 Stripping and Stockpiling of Topsoil

Prior to excavating, the existing topsoil surface shall be stripped and stockpiled from within the limits of the proposed excavation.

3.03 Removal of Fences, Signs, Mailboxes, Ornaments, and Other Objects

Fences, signs, mailboxes, ornaments, and similar objects that fall within the project area shall either be protected or removed. If removed, the materials shall be carefully taken apart and stored in a place where they will not be damaged or stolen.

Where mailboxes are removed, a temporary mailbox shall be installed and maintained by the Contractor until the permanent one is replaced.

Traffic signs shall not be removed unless approved by the agency responsible for them. If approved for removal, traffic signs and posts shall be reinstalled in accordance with the requirements of the agency responsible for them.

If any of the materials to be removed are damaged or badly deteriorated before the Contractor removes them, the Contractor shall notify the Owner before the object is removed. Materials that are damaged, stolen, or lost after they have been removed shall be replaced by the Contractor at no increase in project cost.

3.04 Conflicts with Utility Poles

Where the proposed excavation requires that a pole or guy be supported or temporarily relocated, the Contractor shall make arrangements with the appropriate utility to have the pole or guy supported or relocated. Any costs for this shall be the Contractor's expense.

If the Contractor supports the pole or relocates the guy themselves, the method used shall meet the approval of the appropriate utility. The Contractor shall be solely responsible for any supporting work to the utility company.

3.05 Trees and Brush

Brush lying within the limits of the proposed excavation shall be cleared by the Contractor. Brush shall be removed from the project area and disposed of properly.

Trees lying within the limits of the proposed excavation that are to be removed shall be cut down by the Contractor. Plans may not show all trees of all nature and the Contractor shall become familiar with the project and base their work on their own assessment. The Contractor shall coordinate with the Owner as to which trees are to be left in place and those that will be acceptable to remove. The Contractor shall notify the property owner (or the adjacent property owner if the tree is located in a public right-of-way) in advance of cutting down tree(s). The wood from the tree(s) shall be offered to the landowner. If the landowner wants the wood, the tree shall be cut into sections 8 feet long and stacked adjacent to the project area.

Small branches, limbs, and other debris shall be removed from the area by the Contractor and disposed of properly. If the landowner does not want wood from the trees, all wood including branches, limbs, and other debris shall be removed from the area by the Contractor and disposed of properly.

Stumps shall be removed in their entirety and disposed of away from the project area in an acceptable manner. Burning or burying along the project route is not acceptable.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE

PART 1 -GENERAL

1.01 Work Included

This specification describes the requirements for constructing an aggregate base under a proposed pavement surface.

1.02 References

A. Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

A. Section 01 45 16.02 – Density and Aggregate Testing

PART 2 -PRODUCTS

2.01 Materials

A. Aggregate shall meet the requirements of Series 21AA aggregate, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction, unless otherwise noted on the plans, proposal, or specifications.

PART 3 -EXECUTION

3.01 Subgrade Preparation

Aggregate shall not be placed until the subgrade is properly prepared. The subgrade shall be graded to the required elevations and shape for placement of the specified aggregate thickness. The subgrade shall be compacted according to Section 01 45 16.02 – Density and Aggregate Testing. Soft or yielding spots shall be excavated and replaced with sound material.

3.02 Placement

Aggregate shall be placed in a manner that provides a uniform cross section of the specified thickness and the required surface grades. The edges of the area of aggregate surface shall be straight and uniform.

Aggregate shall be placed in lifts not exceeding 8 inches (loose measure) and compacted according to Section 01 45 16.02 – Density and Aggregate Testing.

END OF SECTION

SECTION 31 23 01
EXCAVATING, FILLING, AND GRADING

PART 1 - GENERAL

1.01 Work Included

The work of excavating, filling, and grading includes, but is not necessarily limited to:

- A. Excavating for footings and foundations;
- B. Filling and backfilling to attain indicated grades;
- C. Trenching and trench backfilling;
- D. Rough and finish grading of the site; and
- E. Furnishing and installing granular cushion under concrete slabs on grade.
- F. All references to "Engineer" in this specification shall be interpreted as "Owner". Owner will determine the involvement of the Engineer during construction.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- B. Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

- A. Section 01 41 26 – Permit Requirements
- B. Section 01 45 16.02 – Density and Aggregate Testing
- C. Section 02 41 13.13 – Pavement Removal
- D. Section 31 25 00 – Soil Erosion and Sedimentation Control

1.04 Job Conditions

- A. Dust Control

Dust caused by the Contractor's operations during performance of the work, or resulting from the condition in which the Contractor leaves the site, shall be controlled by the Contractor. The Contractor shall use all means necessary to control dust on and near the work zone and all off-site borrow areas.

All surfaces shall be thoroughly moistened, as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the site.

B. Protection

The Contractor shall use all means necessary to protect all materials before, during, and after installation and to protect all objects designated to remain.

In the event of damage, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

C. Safety

The Contractor is responsible for conducting operations in a safe and orderly manner and in conformance with MIOSHA P.A. 154.

D. Permits

Unless otherwise provided, the Contractor is responsible to obtain and comply with permits required under Parts 31 and 91 of Michigan PA 451 of 1994 (Natural Resources and Environmental Protection Act) and any local ordinances.

PART 2 - PRODUCTS

2.01 Fill Material – General

All fill material shall be subject to the approval of the Engineer.

For approval of fill material, notify the Engineer at least four working days in advance of intention to import material, designate the proposed borrow area, and permit the Engineer to sample, as necessary, from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

2.02 Fill, Trench, and Structural Backfill Material

Fill material, unless specified otherwise, shall be soil or soil-rock mixture that is free from organic matter and other deleterious substance. It shall contain no rocks or lumps over 6 inches in greatest dimension and not more than 15 percent of the rocks or lumps shall be larger than 2½ inches in greatest dimension.

Fill material obtained from offsite sources shall meet the requirements of the preceding paragraph and additionally, shall be predominantly granular with a maximum particle size of 2 inches and a plasticity index of 12 or less.

Fill material placed within 2 feet horizontally of the base of building foundations and/or slabs shall have a plasticity index of 15 or less.

2.03 Sand

Sand shall meet the requirements of Granular Material Class II, as specified in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.04 Granular Cushion

Granular cushion under slabs shall meet the requirements of Granular Material Class II, as specified in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.05 Sand for Backfill

Sand shall meet the requirements of Granular Material Class II, as specified in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.06 Stone for Pipe Bedding

Stone shall meet the requirements of Series 6AA aggregate, as specified in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.07 Stone for Backfill

Stone shall meet the requirements of 21AA crushed aggregate or 4G open-graded aggregate, as specified in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.08 Flowable Fill

Flowable fill shall be a mixture of Portland cement, fly ash, sand, and water in the following proportions.

Flowable Fill Mixture Ratios		
Material	Type	Quantity
Portland Cement	Type I or IA	50 lb/cyd
Fly Ash	ASTM C618, Class C or F	500 lb/cyd
Sand	MDOT 2NS	2,850 lb/cyd
Water		Approx. 376 lb/cyd (sufficient to produce desired flowability)

Flowable fill shall be produced and delivered at a minimum temperature of 50 degrees Fahrenheit. Mixtures shall be transported to the point of placement in a revolving drum mixer or agitator.

2.09 Geotextile

Geosynthetics must be composed of long-chain synthetic fiber of at least 85 percent, by weight, polyolefins or polyesters. Geosynthetics must be capable of resisting degradation from chemicals, mildew, rot, and ultraviolet (UV) light.

Geotextile used to prevent intermixing of soft subgrade and subbase materials shall meet the requirements per the Michigan Department of Transportation 2020 Standard Specifications for Construction, as shown in Table 910-1 for geotextile stabilization and separator.

2.10 Other Materials

All other materials not specifically described, but required for a complete and proper installation, shall be as selected by the Contractor and subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 General

Prior to all work of this section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this section. The Contractor shall not allow or cause any of the work performed or installed to be covered up or enclosed by work of this section prior to all required inspections, tests, and approvals. Should any of the work be enclosed or covered up before it has been approved, the Contractor shall uncover all such work at no additional cost to the Owner. After the work has been completely tested, inspected, and approved, the Contractor shall make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

The Contractor shall excavate ahead of the proposed utility installation to expose any existing buried utilities. If existing utility grades conflict with the proposed utility grade, the proposed utility grade may be adjusted by the Engineer, if necessary, to miss the existing utility grade at no additional expense to the contract.

3.02 Geotextile Stabilization and Geotextile Separator

Deliver and store geosynthetics in packaging capable of resisting UV radiation, contaminants, and moisture. Label each unit of material with product information, including supplier and lot identification. Do not expose geosynthetics to direct sunlight for prolonged periods. Repair or replace damaged geosynthetics at no additional cost to the project.

A. Geotextile Placement

Place or install geotextile products in accordance with the manufacturer's installation guidelines and this subsection.

Do not operate equipment required to place backfill directly on geotextile products. Eliminate wrinkles or waves that develop during placement. Place the products in direct contact with the soil below before placing backfill on the geotextile products.

Shingle-lap longitudinal and transverse joints at least 2 feet, or seam the joints in accordance with the manufacturer's recommendations. Ensure field or factory seams meet the minimum grab tensile strength for the product application. Place seams facing upward for inspection purposes.

Repair tears or damage to the geotextile in accordance with the manufacturer's recommendations.

B. Aggregate or Granular Material Placement

Spread and grade the first layer of aggregate or granular material after placing geotextile to create a stable work platform before compaction. Place additional aggregate or granular material, as required, and compact. Fill ruts with additional aggregate or granular material and compact before placing each subsequent layer. The cost of aggregate or granular material, including additional quantities required to fill ruts, is included in the unit prices for related pay item(s).

3.03 Excavating

Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, the Contractor shall open the depression and remove all debris and soft material as directed by the Engineer.

The Contractor shall excavate to the grades shown on the drawings. Where excavation grades are not shown on the drawings, excavation shall be completed, as required, to accommodate the installation.

All over-excavated areas shall be backfilled and compacted at no additional cost to the Owner.

3.04 Preparation of Subgrade

After the site has been cleared, stripped, and excavated to within 6 inches of the specified depths for recompaction, the exposed surface shall be scarified to a minimum depth of 6 inches, thoroughly moisture-conditioned, and compacted to the requirements specified below for fill.

All ruts, hummocks, and other uneven surfaces shall be removed by surface grading prior to placement of fill.

3.05 Subgrade Undercutting

Subgrade undercutting shall be performed to replace material susceptible to frost heaving, differential frost action, or unstable soil conditions, as determined by the Engineer.

After the subgrade has been excavated to the approximate grade, the Engineer will inspect the grade to determine if subgrade undercutting is required and to determine the limits of such undercutting. The Contractor shall provide suitable equipment for proof rolling the grade. The inspection, proof rolling, and subgrade undercutting shall be completed prior to placing any embankment, road base, or pavement.

The Contractor shall undercut the subgrade within the limits defined by the Engineer. All excavated material resulting from the undercutting shall become the Contractor's property disposed of outside the project limits, unless otherwise directed. The volume of earth removed by subgrade undercutting shall be replaced by suitable soils as follows:

- A. Type I Subgrade Undercutting - backfill with selected clay or similar material approved by the Engineer.
- B. Type II Subgrade Undercutting - backfill with sand.

Backfill material shall be compacted according to Section 01 45 16.02 – Density and Aggregate Testing.

3.06 Excess Water Control

Fill material shall not be placed, spread, or rolled during unfavorable weather conditions. Operations shall not resume until moisture content and fill density are satisfactory to the Engineer. Berms or channels shall be provided to prevent flooding of subgrade. All water collecting in depressions shall be promptly removed.

Where soil has been softened or eroded by flooding or placement during unfavorable weather, all damaged areas shall be removed and compacted as specified below for fill and compaction.

The Contractor shall provide suitable means and equipment to maintain excavations and other parts of the work free from water.

Dewatering means and methods shall provide dry excavations and the preservation of the final lines and grades of bottoms of excavations.

3.07 Fill and Compaction

After subgrade compaction has been approved by the Engineer, the Contractor shall place approved fill material in layers not exceeding 8 inches in uncompacted thickness.

The fill material shall be watered or aerated, as necessary, and thoroughly mixed to obtain a moisture content that will permit proper compaction.

Each soil layer shall be compacted to at least the specified minimum degree. The filling and compaction process shall be repeated until plan grade is attained.

A. Compaction Requirements

Unless otherwise specified on the drawings or in other sections of the specifications, fill and backfill shall be placed in 8-inch lifts and each lift shall be compacted to not less than the percentages of the maximum density stated in Section 01 45 16.02 – Density and Aggregate Testing.

Compaction by jetting will not be permitted unless specifically authorized by the Engineer.

3.08 Grading

Except as otherwise directed by the Engineer, the Contractor shall perform all rough and finish grading required to attain the elevations shown on the drawings.

Tolerances For Grading			
Rough Grade		Finish Grade	
Building, roads, and parking areas	Plus or minus 0.1 feet	Granular cushion under concrete slabs	Plus or minus 0.05 feet

Tolerances For Grading			
Rough Grade		Finish Grade	
Landscaped areas	Plus or minus 0.25 feet	Parking areas	Plus or minus 0.03 feet
		Landscaped areas	Plus or minus 0.1 feet

After grading is completed and has been accepted by the Engineer, the Contractor shall permit no further excavating, filling, or grading.

The Contractor shall use all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.09 Excavating for Footings

Earth surfaces, upon which footings will be placed, shall be compacted in accordance with the compaction requirements established in this section of these specifications.

The Contractor shall verify that all compaction is complete and approved prior to excavating for footings.

The Contractor shall excavate to the required lines and grades. The bottom of trenches shall be cut level and all loose soil shall be removed. Where soft spots are encountered, unsuitable materials shall be removed and replaced with flowable fill at no additional cost to the Owner.

3.10 Placing Granular Cushion

The Contractor shall carefully place the specified granular cushion in areas to receive concrete slabs on grade, uniformly attaining the thickness indicated on the drawings, and providing all required transition planes.

3.11 Trenching

The Contractor shall perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these specifications.

All trenches shall be open construction, with sufficient width to provide free working space at both sides of the trench and around the installed item as required for pipelaying, backfilling, and compacting.

Trenching shall be completed, as required, to provide the elevations shown on the drawings. Where elevations are not shown on the drawings, trench to sufficient depth to give a minimum of 18 inches of fill above the top of the pipe, measured from the adjacent finished grade.

Where trench excavation is inadvertently carried below proper elevations, the over-excavated area shall be backfilled with material approved by the Engineer, and then compacted to provide a firm and unyielding subgrade and/or foundation to the approval of the Engineer and at no additional cost to the Owner.

The Contractor shall properly support all trenches in accordance with all applicable rules and regulations.

The Contractor shall brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage.

In the event of damage to such improvements, the Contractor shall immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

Bracing, sheeting, and shoring shall be constructed so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength. The Contractor shall exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse and caving of the excavation faces being supported.

Trenched material shall be stockpiled in a manner to prevent water running into the excavations. Surface drainage shall not be obstructed. A means shall be provided whereby storm and wastewaters are diverted into existing gutters, other surface drains, or temporary drains.

3.12 Foundation for Pipes

Trench bottoms shall be graded to provide a smooth, firm, and stable foundation free from rock points throughout the length of the pipe.

A minimum of 4 inches of sand or stone bedding shall be placed in the bottom of the trench.

In areas where soft, unstable materials are encountered at the surface where the bedding is to be placed, the unstable material shall be removed and replaced with material approved by the Engineer. The area shall be undercut to a sufficient depth to develop a firm foundation for the item being installed. Over excavation and replacement of material shall be the responsibility of the Contractor and shall be completed at no additional cost to the Owner.

At each joint in pipe, the bottom of the trench shall be recessed, as required, to relieve the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation.

The pipe subgrade shall be shaped to fit the bottom of the trench to the pipe shape.

3.13 Bedding for Pipes

Pipe bedding shall be in accordance with the details in the construction plans.

The pipe bedding shall be shaped to match the bottom $\frac{1}{4}$ of the pipe's shape. The bedding shall be excavated to accommodate the pipe bells. The completed bedding shall provide uniform support of the entire length of pipe.

The bedding material shall be compacted after placing along both sides of the pipe.

3.14 Backfill for Pipes

Unless otherwise directed, all trenches and excavation shall be backfilled as the pipe is laid. No pipes shall be backfilled until the sewer elevations, gradient, alignment, and the pipe joints have been observed by the Engineer.

The trench shall be backfilled to the proposed final elevations with suitable materials. Unless other compaction methods are demonstrated and approved by the Engineer, backfill shall be placed in 8-inch lifts and compacted to the required density as stated in Section 01 45 16.02 – Density and Aggregate Testing.

In areas which are not to be restored with a pavement or aggregate surface, the backfill shall be graded to a height slightly above the adjacent surface. When final restoration of the area is completed by the Contractor, the backfill surface shall be excavated (or filled if settlement has occurred), trimmed, or graded, as necessary, to provide for the required depth of topsoil and its transition to adjacent, undisturbed areas.

The Contractor shall correct any areas where the trench backfill settles by adding fill, topsoil, and re-seeding.

3.15 Miscellaneous Pipe Repair

When an existing sewer pipe, drain pipe, field tile, or other existing pipe is damaged as a result of construction activities and is not designated for removal or abandonment on the plans or by the Engineer, it shall be repaired by the Contractor.

The section of damaged pipe shall be removed to existing joints or to sawed joints where the existing pipe is sound and undamaged. A length of new pipe of the same size as the original pipe shall be furnished and installed to replace the section of pipe removed. The new pipe may be any one of the following materials:

- A. Same material, class or thicknesses, as the original pipe
- B. PVC Schedule 40, for pipes 8 inches or less in diameter
- C. PVC SDR 26, for pipes 8 inches or greater in diameter
- D. Other pipe material approved by the Engineer

Each end of the new section of pipe shall be connected to the remaining sections of existing pipe using a rubber gasketed sleeve, suitable for the pipe materials and sizes being joined, to provide a watertight connection. The repaired section of pipe shall be firmly bedded in sand or stone, compacted according to Section 01 45 16.02 – Density and Aggregate Testing.

END OF SECTION

SECTION 31 25 00
SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 Work Included

The Contractor shall provide permanent and/or temporary erosion and sedimentation control as called for on the plans and as required by the county soil erosion agent and permit.

1.02 Definitions

~~A.~~ Major rainfall event – ¼-inch or more precipitation over a period, delineated by dry periods of at least 24 hours.

1.03 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

~~A.~~ ASTM D3786 – Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method

~~B.~~ ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

~~C.~~ ASTM D4491 – Standard Test Method for Water Permeability of Geotextiles by Permittivity

~~D.~~ ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles

~~E.~~ ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

~~F.~~ ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile

~~G.~~ ASTM D4833 – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

~~H.~~ Michigan Department of Transportation 2020 Standard Specifications for Construction

1.04 Related Work

~~A.~~ Section 01 41 26 – Permit Requirements

~~B.~~ Section 31 37 00 – Riprap

~~C.~~ Section 32 92 00 – Turf Establishment

1.05 Permit

The Contractor shall apply for and obtain an Act 451 permit from the local Soil Erosion and Sedimentation Control Enforcing Agent. The Contractor shall pay all permit fees and provide any required bonds or insurance.

1.06 Scheduling

- A.** Control measures shall be constructed by the Contractor prior to the time construction starts uphill or upstream from the control measure location.
- B.** The Contractor shall inspect all temporary erosion control measures weekly and within 18 hours of major rainfall events.
- C.** Maintenance and replacement of erosion control measures shall be completed by the Contractor when necessary, or as directed by the soil erosion control agent or the Owner.
- D.** Removal and cleanup of temporary control structures shall be provided by the Contractor within one week after the control measure is no longer needed.

1.07 General Soil Erosion and Sedimentation Control Procedures

- A.** Keep disturbed areas small.
- B.** Stabilize and protect disturbed areas as soon as possible.
- C.** Keep storm water runoff velocities low.
- D.** Protect disturbed areas from runoff.
- E.** Retain sediment within the construction area.

PART 2 - PRODUCTS

2.01 Materials

A. Geotextiles

Geotextiles for filters shall be non-woven, meeting the requirements of the table below.

Silt fence geotextiles shall meet the requirements of the following table and shall be designed to collect eroded sediment transported in storm water runoff. The fabric shall have at least 70 percent minimum retained strength after 500 hours of U.V. exposure when tested according to ASTM D4355.

Geotextile Category	Property/Test Method					
	Grab Tensile Strength (min) ASTM D4632 lbs	Trapezoid Tear Strength (min) ASTM D4533 lbs	Puncture Strength (min) ASTM D4833 lbs	Mullen burst strength (min) ASTM D3786 psi (a)	Permittivity ASTM D4491 Per second	Apparent Opening Size (max) ASTM D4751 (b) Millimeters
Filters	90	45	45	140	0.5	0.21
Silt Fence	100(c)	45	--	--	0.1	0.60
(a) ASTM D3786. The fluid displacement rate for the Mullen burst test equipment must be 170± 5 ml/minute. Subtract tare strength from the ultimate burst strength as specified by ASTM.						
(b) Filtration opening size (FOS, Canadian General Standards Board, method 148.1 No. 10) is permitted as an alternate test method to ASTM D4751 for non-woven geotextiles.						
(c) Elongation at the specified grab tensile strength not to exceed 40 percent for silt fence.						

B. Stone

Unless otherwise directed, stone shall meet the requirements of Series 6AA as specified in Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.02 Mixtures

A. Seed

Seed shall meet the requirements of Section 32 92 00 – Turf Establishment.

2.03 Fabricated Items

A. Silt Fence

Geotextile for silt fences shall meet the requirements of Section 2.01. The geotextile shall be attached to machine pointed No. 2 common grade hardwood posts, using at least 5 staples through wood lath a minimum of $\frac{3}{8}$ -inch thick and 2 feet long. Post spacing shall not exceed $6\frac{1}{2}$ feet. Posts must be of sufficient length and cross-section to support the installed silt fence under full sediment load; however, posts shall have cross-sectional area of at least $2\frac{1}{4}$ square inches and shall be a minimum of 36 inches in length. Silt fence fabric must be a minimum height of $2\frac{1}{2}$ feet. Silt fence shall have at least two permanent markings or affixed labels per assembled roll which positively identifies the fabricator.

B. Mulch Blankets

Mulch blankets shall meet the requirements of Section 32 92 00 – Turf Establishment.

C. Filter Sacks

All materials shall adhere to the requirements of the Michigan Department of Transportation 2020 Standard Specifications for Construction, except fabric drop, which shall consist of a geotextile filter sack inserted into the drainage structure under the cover.

Filter sack shall be as manufactured by “Siltsack”, “Catch-All”, “Ultra-Urban Filter”, “Flogard + Plus”, or approved equal. The filter sacks shall be installed and maintained in accordance with the manufacturer’s specifications.

PART 3 - EXECUTION

3.01 General Requirements

The Contractor shall perform work on the project in a manner which prevents or reduces erosion and controls sedimentation. The Contractor shall provide controls which keep sedimentation from the project area, within the limits of the project area, and out of any lake, river, stream, wetland, or storm drain.

The Contractor shall install appropriate controls or measures to control or prevent erosion or sedimentation from the project area before beginning any earth disturbance operations. Temporary erosion and sedimentation control measures shall be maintained by the Contractor, until such times as disturbed areas have become permanently stabilized.

During the life of the project, the Contractor shall provide any additional soil erosion or sedimentation control measures necessary to address specific problems which develop in and adjacent to the project area.

3.02 Time Limitations

Grading operations shall be completed as soon as practical. Permanent soil erosion controls for disturbed areas shall be completed within 5 calendar days of the completion of grading, except that permanent measures shall be completed within 24 hours when the disturbed area is within 150 feet of a lake, stream, river, or wetland area.

Temporary soil erosion measures shall be implemented when it is not practical to complete the permanent measures.

3.03 Area Limitations

For linear projects (roads, sewers, water main, etc.), the length of the disturbed area shall be limited to ½-mile, unless otherwise approved by the Owner.

Areas outside the project right-of-way or outside the grading limits shown on the drawings shall not be disturbed, unless otherwise approved by the Owner.

3.04 Construction of Erosion and Sedimentation Controls

The Contractor shall provide all permanent and temporary erosion and sedimentation controls shown on the drawings, required by the permitting agency, or necessary to appropriately control erosion and sedimentation from the project area.

A. Check Dams

Check dams shall be installed and maintained across ditches and watercourses, which might convey surface runoff from disturbed areas within the project area, or where shown on the drawings or required by the Owner or permitting agency.

B. Silt Fence

The Contractor shall furnish, erect, and maintain silt fence around the perimeter of the project area where earth will be disturbed and sediment from the disturbed area could be conveyed.

C. Filters

Fabric or stone filters shall be installed in waterways or in advance of inlets to drainage courses or storm sewers.

D. Sediment Traps and Basins

Sediment traps shall be excavated upstream of check dams and where shown on the drawings or directed by the Owner or permitting agency. Check dams shall be installed downstream of the sediment traps and basins prior to the sediment traps and basins being excavated.

E. Seeding

Earth areas shall be stabilized with turf immediately following the completion of earthwork and grading activities. Where permanent seeding cannot be completed, earth areas shall be

stabilized with temporary seeding. Areas which are properly seeded temporarily for stabilization shall be permanently seeded, as shown, as the work can be appropriately completed.

F. Mulch Blankets

Areas susceptible to erosion from moving water, which are not to be paved, shall be seeded and protected with high velocity mulch blankets.

3.05 Maintenance and Erosion and Sedimentation Control

The Contractor shall maintain all temporary erosion and sedimentation controls until such time as the permanent measures have been completed and established.

The Contractor shall inspect all erosion and sedimentation controls weekly and within 18 hours of a major rain event.

Damaged controls or measures shall be replaced or repaired. Sediment shall be cleaned from traps, sumps, basins, filters, and fences periodically. Sediment shall be removed to prevent the accumulation of sediment from exceeding half of the volume of traps, sumps, and basins. Sediment or debris along silt fences shall be removed before the accumulation reaches half the height of the fence.

Sediment and debris removed from soil erosion and sedimentation control devices shall be disposed of properly by the Contractor. Sediment shall not be used for fill or backfill in the project area, except when an area is specifically designated on the plans or by the Owner.

Drainage filters shall be cleaned when an accumulation of silt might reduce flow and result in flooding.

Any sediment from the construction area which enters storm sewers or drainage ditches shall be removed by the Contractor. Since sediment can be carried great distances within storm sewers, it may be necessary for many segments of downstream storm sewer segments to be televised, jetted, and vacuumed. If the Owner believes that the Contractor has allowed or provided the potential for sediment to enter storm sewers or drainage courses, the Contractor will be responsible for the costs of inspection and removing sediment from downstream drains, whether it can be conclusively proven that the sediment was the result of the Contractor's actions (or inaction).

3.06 Removal of Erosion and Sedimentation Control Devices

Temporary soil erosion and sedimentation control devices shall be removed or obliterated by the Contractor when the permanent measures are in place and established. Any areas damaged by the removal of the temporary devices shall be corrected by the Contractor.

Mulch used for temporary erosion control may either be removed or worked into the soil before the permanent topsoil and seeding is completed.

END OF SECTION

SECTION 32 13 00
CONCRETE CURB AND GUTTER, SIDEWALK,
AND MISCELLANEOUS PAVEMENT

PART 1 - GENERAL

1.01 Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete curb and gutter, sidewalk, and miscellaneous pavement.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- B. ASTM C94 – Standard Specification for Ready-Mixed Concrete
- C. ASTM C150 – Standard Specification for Portland Cement
- D. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- E. ASTM A706, ASTM A615, or ASTM A996 (Type R or Type A only) for Grade 60 steel bars
- F. ASTM A775 for epoxy coated steel reinforcement
- G. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
- H. Michigan Department of Transportation 2020 Standard Specifications for Construction
- I. Michigan Department of Transportation Standard Plan
- J. All references to “Engineer” in this specification shall be interpreted as “Owner”. Owner will determine the involvement of the Engineer during construction.

1.03 Related Work

- A. Section 01 45 16.01 – Concrete Testing
- B. Section 01 45 16.02 – Density and Aggregate Testing
- C. Section 02 41 13.13 – Pavement Removal

PART 2 - PRODUCTS

2.01 Materials

- A. Portland cement shall meet the requirements of ASTM C150.
- B. Coarse aggregate shall meet the requirements of Class 6AA aggregate, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction.
- C. Intermediate aggregate shall meet the requirements of Class 26A aggregate, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction.
- D. Fine aggregate shall meet the requirements of Class 2NS, 2SS, or 2MS aggregate, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction.
- E. Reinforcing steel fabric shall meet the requirements of ASTM A1064.
- F. Deformed bars must meet the requirements of ASTM A706, ASTM A615, or ASTM A996 (Type R or Type A only) for Grade 60 steel bars, unless otherwise required. All deformed bars shall be epoxy coated.
- G. Epoxy coated steel reinforcement must be coated in accordance with ASTM A775.
- H. White membrane curing compound shall conform to ASTM C309, Type 2. Curing compound shall be agitated to provide a uniform consistency prior to transfer between containers or before application.
- I. Fiber joint filler shall meet the requirements of ASTM D1751.
- J. Sand for base shall meet the requirements of Granular Material Class II, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction.

2.02 Mixtures

Concrete shall be transit mixed 3,500 psi concrete in accordance with ASTM C94 and Section 01 45 16.01 – Concrete Testing.

Air content, slump, and compressive strength shall be according to Section 01 45 16.01 – Concrete Testing. Concrete shall contain at least six sacks of cement per cubic yard of concrete. Modifications and the use of admixtures may be submitted and shall be approved by the Engineer.

2.03 Submittals

- A. Prior to beginning construction, the Contractor shall submit the name and plant location of the proposed concrete supplier for the project.
- B. Prior to beginning construction, the Contractor shall submit mix designs for the proposed concrete mixtures proposed for use on the project for the Engineer to review.

2.04 Cross Sections

A. Sidewalk

Unless indicated otherwise on the plans, sidewalk shall have a minimum thickness of 4 inches. Designer shall modify Section 2.04.A with the steel reinforcement requirements if applicable.

B. Pavement

Concrete pavement section shall be as indicated on the plans.

PART 3 - EXECUTION

3.01 Coordination of Traffic

Hazardous areas shall be barricaded to protect pedestrian and vehicular traffic.

Work shall be scheduled so that access is maintained to driveways and entrances through the project area to the extent possible. Where a driveway or entrance must be closed for a period, the property owner or occupant shall be notified in advance of the closing.

3.02 Removal of Existing Sidewalk, Curb and Gutter, and Pavement

Where an existing sidewalk, curb and gutter, and/or pavement are to be removed and replaced, the existing structure shall be removed in accordance with Section 02 41 13.13 – Pavement Removal.

3.03 Preparation

The base shall be excavated, filled, and shaped, as required, to construct pavement of the required thickness at the proposed grades and alignment. The base shall be compacted according to Section 01 45 16.02 – Density and Aggregate Testing. Soft and yielding soils shall be excavated and replaced with suitable soils.

Where existing curb and gutter has been removed and prior to constructing new curb and gutter, the Contractor shall install 2 dowels, 1/2-inch in diameter, into existing curb and gutter at each end. Cost of dowels are included in the payment for curb and gutter.

Forms shall extend the full depth of the concrete. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete. Flexible forms capable of making a smooth arc shall be used for curved sections. Face forms for the exposed face of curb are not required.

Where steel reinforcement is used, it shall be spliced and held in place in a manner approved by the Engineer. Splices shall be overlapped by 10 inches.

3.04 Required Grades

A. Driveways shall be constructed with a maximum slope of 10 percent.

B. Sidewalks shall be constructed with a maximum transverse slope of 2 percent. Transverse

slopes shall be at least 1 percent, unless longitudinal drainage is provided. The longitudinal slope of sidewalk shall not exceed 5 percent (1/20) unless handrails are provided. The longitudinal slope of sidewalk with handrails shall not exceed 8.3 percent (1/12).

3.05 ADA Requirements

A. Sidewalks shall meet ADA requirements.

3.06 Placement of Concrete

Concrete shall not be placed until the forms have been inspected by the Engineer. The Contractor shall notify the Engineer a minimum of 24 hours prior to scheduling a concrete pour.

The base shall be moistened just prior to placement of the concrete.

Concrete shall have a temperature between 45 degrees Fahrenheit and 90 degrees Fahrenheit at the time of placement.

Concrete shall be deposited to the proper depth and spaded or vibrated to ensure proper consolidation. Concrete shall be placed and finished in a continuous operation.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces of the concrete slab shall be finished smooth and even by means of a moistened wood float. Sidewalk and pavement slabs shall be lightly brushed perpendicular to the normal direction of traffic. Water shall not be added to the concrete surface as an aid to finishing. The top edges of the slab and all transverse joints shall be rounded with a finishing tool having a radius of ¼-inch. Surfaces shall not vary more than 3/8-inch from the alignment and typical cross section.

Joints shall be constructed in accordance with the Michigan Department of Transportation Standard Road Plan R-29 Series.

Expansion joint filler shall extend the full depth of the concrete, with the top of the filler material just below the finished concrete surface.

Exposed concrete surfaces shall be cured using white membrane curing compound, applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

3.07 Protection

Concrete shall not be placed if the air temperature is not at least 25 degrees Fahrenheit and rising, or more than 90 degrees Fahrenheit. Concrete shall be protected from damage caused by freezing or rain.

The Contractor shall provide protection for existing surfaces (building faces, light poles etc.) from splattering of concrete. Any damage to building faces, light poles, etc. from concrete splatter shall be repaired or replaced at the Contractor's expense.

The Contractor shall provide sufficient barricading and security to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Contractor's expense.

~~3.08~~ Cleanup

After the concrete has attained sufficient strength, the forms shall be removed.

Where adjacent areas are turf, the area next to the pavement shall be backfilled with sound earth and topsoil, and graded so the surface is about 1-inch below the pavement or as necessary to provide proper drainage.

END OF SECTION

SECTION 32 12 16
HMA PAVING

PART 1 - GENERAL

1.01 Work Included

This work includes preparation for and construction of one or more courses of plant mixed Hot Mix Asphalt (HMA).

1.02 References

- A. Michigan Department of Transportation 2020 Standard Specifications for Construction
- B. Michigan Testing Methods (MTM)
- C. Michigan Department of Transportation HMA Production Manual
- D. ASTM E965 – Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique

1.03 Related Work

- A. Section 01 45 16.02 – Density and Aggregate Testing
- B. Section 32 11 23 – Aggregate Base
- C. Section 33 05 00 – Adjusting Structures

1.04 Quality Assurance and Quality Control

- A. The Engineer will take 20,000 gram samples of the HMA mixture using the mini-stockpile method. The rate of sampling will be determined by the Engineer.

PART 2 - PRODUCTS

2.01 Submittals

The Contractor shall submit material source and mix designs to the Engineer for approval prior to the start of construction.

2.02 Mixtures

Materials shall meet the requirements of Sections 501.02, 902, and 904 of the Michigan Department of Transportation 2020 Standard Specifications for Construction. If milling, the mix design to initially cover the milled surface must be approved prior to milling operations.

Superpave Mixes

Provide aggregates, mineral filler (if required) and asphalt binder to produce a mixture proportioned within Superpave Final Aggregate Blend Gradation Requirements, and meeting the uniformity tolerance limits in the Uniformity Tolerance Limits for HMA Mixtures tables below.

Superpave Final Aggregate Blend Gradation Requirements					
	Mix Number				
	5	4	3 Leveling Course	3 Base Course	2
Standard Sieve	% Passing Criteria (Control Points)				
1½ inch	-	-	-	-	100
1 inch	-	-	100	100	90-100
¾ inch	-	100	90-100	90-100	≤90
½ inch	100	90-100	≤90	≤90	-
⅜ inch	90-100	≤90	-	-	-
No. 4	≤90	-	-	-	-
No. 8	47-67	39-58	35-52	23-52	19-45
No. 16	-	-	-	-	-
No. 30	-	-	-	-	-
No. 50	-	-	-	-	-
No. 100	-	-	-	-	-
No. 200	2.0-10.0	2.0-10.0	2.0-8.0	2.0-8.0	1.0-7.0

Uniformity Tolerance Limits for HMA Mixtures					
Parameter		Top and Leveling Course		Base Course	
Number	Description	Range 1 (a)	Range 2 (b)	Range 1 (a)	Range 2 (b)
1	% Binder Content	-0.3 to +.4	+/- 0.5	-0.3 to +0.4	+/- 0.5
2	% passing # 8 and Larger Sieves	+/- 5	+/-8	+/- 7	+/- 9
		+/- 4	+/- 6	+/-6	+/-9
		+/- 1	+/- 2	+/- 2	+/- 3
3	Crushed Particle Content	Below 10%	Below 15%	Below 10%	Below 15%
(a) This range allows for normal mixture and testing variations. The mixture must be proportioned to test as closely as possible to the Job-Mix-Formula (JMF).					
(b) Deviation from JMF.					

Parameter Number 2, as shown in the Uniformity Tolerance Limits for HMA Mixtures table, is aggregate gradation. Each sieve will be evaluated on one of the three gradation tolerances. If more than one sieve is exceeding Range 1 or Range 2 tolerances, only the one with the largest exceedance will be counted as the gradation parameter.

The master gradation should be maintained throughout production; however, price adjustments will be based on the Uniformity Tolerance Limits for HMA Mixtures table. Aggregates which are used in plant-mixed HMA mixtures must not contain topsoil, clay, or loam.

The mixture will be considered out-of-specification, as determined by the acceptance tests, if for any one mixture, two consecutive tests per parameter, (for Parameter 2, two consecutive aggregate gradations on one sieve) are outside Range 1 or Range 2 tolerance limits. If a parameter is outside of Range 1 tolerance limits and the second consecutive test shows that the parameter is outside of Range 2, then it will be considered to be a Range 1 out-of-specification. Consecutive

refers to the production order and not necessarily the testing order. Out-of-specification mixtures are subject to a price adjustment of 50 percent of the bid amount.

Reclaimed Asphalt Pavement (RAP) shall be limited to 0 percent to 17 percent RAP by weight of the total binder in the mixture. No binder grade adjustment is made to compensate for the stiffness of the asphalt binder in the RAP.

Reclaimed Asphalt Shingles (RAS) will not be allowed in the mixture.

Oil bottoms/recycled motor oil will not be allowed in the mixture.

PART 3 - EXECUTION

3.01 Equipment

Equipment shall meet the requirements of Section 501.03 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

3.02 HMA Sampling and Testing

The Contractor shall submit to the Engineer for approval the rate at which the HMA will be sampled. Samples will be obtained using the “Mini-stockpile” method in accordance with MTM 324.

Quantitative Extraction of Bitumen from HMA Paving Mixtures (MTM 325) will be used to determine the asphalt content of the HMA mixture.

The Engineer is responsible for HMA testing.

Preparation

A. Aggregate Base (for Pavements Constructed on an Aggregate Base)

See Section 32 11 23 – Aggregate Base.

B. Removal of Existing Pavement Surface

1. Butt Joints

When a butt joint is to be provided, the existing HMA surface shall be removed to a thickness equal to the thickness of the proposed overlay, for the full width of the butt joint, where the overlay is to meet the existing pavement surface. The depth of pavement removal shall be uniformly tapered from the full depth of the overlay at the butt joint to zero, at a rate of 1-inch per 10 feet.

2. Edge Trimming

Where the edge of an existing HMA pavement is required, the HMA pavement shall be cut its full depth in a manner that provides a vertical, straight edge.

C. Hand Patching

When hand patching is called for on the plans or directed by the Engineer, the Contractor shall fill holes, depressions, joints and cracks, and areas to be repaired in an existing pavement. HMA material used for hand patching may be any HMA material approved for use as a top course. A bond coat shall be applied to the exposed pavement surfaces within the area to be patched. The HMA material shall be placed in lifts to the level of the surface of the adjacent existing pavement surface. Each lift shall be within the minimum and maximum thickness range allowed for the mix design, and shall be compacted using a mechanical vibrator or an approved roller.

D. Bond Coat

Bond coat shall be applied to existing pavement surfaces, only when they are clean and dry. Bond coats shall be uniformly applied to the pavement surface with a pressure applicator. Bond coat shall be placed in advance of HMA placement to provide for its curing prior to HMA placement.

Bond coat shall not be allowed to pool on the surface; pooling shall be removed. The adjacent pavement surfaces which are not to be overlaid shall not be sprayed with bond coat.

Bond coat shall be applied to each layer of the HMA pavement and to the vertical edges of the adjacent pavements before placing subsequent courses.

E. Transportation of HMA

HMA shall be transported to the project site in accordance with the requirements of Section 501.03.E of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

Each load of HMA delivered to the project site shall be weighed on an approved scale with automatic print out system. Weights shall be measured to the nearest 20 pounds. Scales and print out systems shall meet the requirements of Section 109 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

F. Placement of HMA

HMA shall be placed in accordance with the requirements of Section 501.03.F of the Michigan Department of Transportation 2020 Standard Specifications for Construction and at the rate shown in the HMA Application Rate table in the project plans.

G. Rolling

HMA shall be rolled in accordance with the requirements of Section 501.03.G of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

H. Smoothness requirements as per the requirements of Section 501.03.H of the Michigan Department of Transportation 2020 Standard Specifications for Construction shall be adhered to.

I. Weather and Seasonal Limitations

1. The Contractor shall not place bond coat or HMA when precipitation is imminent or when there is moisture on the existing surface to be overlaid.
2. HMA shall not be placed when the underlying base is frozen, and the surface being paved is at least 35 degrees Fahrenheit.
3. Unless otherwise approved by the Engineer in writing, HMA shall not be placed before May 15 or after November 15.

J. Protection

The Contractor shall protect surfaces, structures, signs, poles, vehicles, and other items adjacent to the area to be paved from being discolored or damaged. Damaged items shall be corrected at the Contractor's expense. The Contractor shall protect the newly placed HMA surface from damage by traffic and construction activities.

K. Aggregate Shoulders

On resurfacing projects, existing aggregate shoulders shall be scarified prior to placing new aggregate.

Shoulders shall be maintained in a satisfactory condition to allow for vehicles to pass construction operations or for the operation of construction equipment. The Contractor shall restore any damages or disturbances to the shoulders, or to the surface between the edge of pavement and the right-of-way. The cost of restoration is considered included in the other work performed by the Contractor and will not be paid for separately.

L. Adjustment of Castings, Manholes, Monument Boxes, Water Valves, and Water Shutoffs

Castings, manholes, water valves, and water shutoffs shall be adjusted in accordance with Section 33 05 00 – Adjusting Structures.

Monument boxes shall be installed or adjusted after placement of the final HMA course, in accordance with Section 33 05 00 – Adjusting Structures.

END OF SECTION

SECTION 32 15 00
AGGREGATE SURFACE

PART 1 - GENERAL

1.01 Work Included

This specification describes the requirements for constructing an aggregate surface for driveways, shoulders, and parking areas.

1.02 References

~~A.~~ Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

~~A.~~ Section 01 45 16.02 – Density and Aggregate Testing

PART 2 - PRODUCTS

2.01 Materials

~~A.~~ Aggregate shall meet the requirements of Series 23A aggregate, as described in the Michigan Department of Transportation 2020 Standard Specifications for Construction, unless otherwise noted on the plans, proposal, or specifications.

PART 3 - EXECUTION

3.01 Subgrade Preparation

Aggregate shall not be placed until the subgrade is properly prepared. The subgrade shall be graded to the required elevations and shaped for placement of the specified aggregate thickness. The subgrade shall be compacted according to Section 01 45 16.02 – Density and Aggregate Testing. Soft or yielding spots shall be excavated and replaced with sound material.

3.02 Placement

Aggregate shall be placed in a manner that provides a uniform cross section of the specified thickness and the required surface grades. The edges of the area of aggregate surface shall be straight and uniform.

Aggregate shall be placed in lifts not exceeding 8 inches (loose measure) and compacted according to Section 01 45 16.02 – Density and Aggregate Testing.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 Work Included

This work includes furnishing and applying pavement markings at locations shown on the plans, in the proposal, or as directed by the Engineer, in accordance with the Michigan Manual on Uniform Traffic Control Devices and as specified herein.

The Contractor is responsible for all layout work necessary for the location and placement of pavement markings, as shown on the plans or in the proposal or as directed by the Engineer.

All markings, shapes, and dimensions shall conform to the Michigan Department of Transportation Pavement Marking Standards or other details provided.

1.02 References

- A. Michigan Department of Transportation 2020 Standard Specifications for Construction
- B. Michigan Manual on Uniform Traffic Control Devices
- C. Michigan Department of Transportation's Qualified Products List
- D. All references to "Engineer" in this specification shall be interpreted as "Owner". Owner will determine the involvement of the Engineer during construction.

1.03 Submittals

The Contractor shall submit a list of all proposed materials and suppliers for pavement marking materials for review prior to performing the work.

1.04 Quality Assurance and Quality Control

The Contractor shall maintain and provide the Engineer with records of application of pavement marking materials, including paint and beads. The records shall include descriptions of the materials used (manufacturer, batch, date of manufacture, etc.) and quantities of each (gallons of paint or binder, pounds of beads).

PART 2 - PRODUCTS

2.01 Materials

A. General Requirements

All pavement markings must be lead-free and selected from the Michigan Department of Transportation's Qualified Products List. Pavement marking materials must be manufactured in the calendar year in which they are to be applied.

B. Packaging and Labeling

Materials shall be furnished in containers or packages plainly marked showing the manufacturer, description of materials, product identification number, batch number, date of manufacture, contents weight, and contents volume.

Thermoplastic material shall be packaged in a manner to prevent it to adhere during storage or shipment. The label on the material shall include the manufacturer's recommendations for the application temperature.

PART 3 - EXECUTION

3.01 Applying Pavement Markings

Prior to the application of pavement markings, the pavement surfaces shall be clean, dry, and free of foreign materials. The Contractor shall be responsible for removal of foreign material, which can be removed by air-blasting. The Contractor shall also be responsible for removing occasional debris or dead animals from the line track. When shown on the plans or in the proposal, or when directed by the Engineer, curing compound on new concrete shall be removed by light sandblasting.

All materials and glass beads shall be placed according to the manufacturer's requirement.

Pavement markings shall be applied uniformly to the surface and so that they adhere adequately, following manufacturer's recommendations. All materials shall be thoroughly mixed at all times during application. Thinning of liquid materials will not be permitted.

Pavement markings shall be of the width called for on the plans, details, or pay item(s). The markings shall be of the color(s) and configuration as shown on the plans, in the proposal, or as directed by the Engineer. A solid line of the color and width specified shall have no gaps or spaces of unapplied material.

Improperly located markings shall be removed at the Contractor's expense, in accordance with Section 811 of the Michigan Department of Transportation 2020 Standard Specifications for Construction and shall be reapplied in the correct locations at no cost to the Owner.

Applied markings shall be sharp and well-defined. The markings shall be free of uneven edges, overspray, or other readily visible defects which, in the opinion of the Engineer, detract from the appearance or function of the pavement markings. Appropriate care shall be taken to prevent motorists and adjacent properties from being sprayed. Shields or other devices may be used for this purpose.

Pavement marking lines shall be straight or of uniform curvature and shall conform with the tangents, curves, and transitions, as specified in the pavement marking plans and/or directed by the Engineer. The lateral deviation of the finished lines shall not exceed ½-inch from the proposed location alignment, as specified in the plans and/or directed by the Engineer.

Any deviation of the pavement marking lines greater than that specified herein, or shown on the pavement marking plans, shall be sufficient cause for requiring the Contractor to remove and

correct such pavement markings at no additional expense to the Owner.

Pavement markings shall be protected from damage by the Contractor during the cure period. Pavement markings damaged by traffic, that were not applied and/or suitably protected, shall be traced at the Contractor's expense as directed by the Engineer. Tracked lines shall be removed at the Contractor's expense when ordered by the Engineer.

Application, temperature, protection, and seasonal restrictions shall be in accordance with Section 811 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

END OF SECTION

SECTION 32 92 00
TURF ESTABLISHMENT

PART 1 - GENERAL

1.01 Work Included

This work includes soil preparation, seeding, fertilizing, and mulching on those areas designated for turf establishment.

1.02 References

- A. Michigan Department of Transportation Qualified Products List
- B. All references to "Engineer" in this specification shall be interpreted as "Owner". Owner will determine the involvement of the Engineer during construction.

1.03 Related Work

- A. Section 31 25 00 – Soil Erosion and Sedimentation Control

1.04 Performance Requirements for Guaranteed Growth and Smooth Ground Surface

The Contractor is responsible to provide turf, substantially free of bare spots and free of weeds. The ground in turf areas shall be smooth, graded to provide positive drainage, and graded to provide a smooth transition to adjacent areas. The Engineer will determine when the requirements of guaranteed growth and smooth ground surface have been met.

Materials, requirements, and methods described in this specification are provided to establish minimum levels. Where the Contractor believes that other materials or methods are appropriate for the specific site conditions or better suited to the Contractor's schedule, the Contractor shall submit details of the alternative materials and/or methods to the Engineer for approval.

The Contractor shall provide re-seeding, watering, and herbicides, as necessary, to achieve the desired results.

There will be no adjustment in project cost for re-seeding, watering, application of herbicides, or using alternative methods of turf establishment.

1.05 Areas Designated for Turf Establishment

All areas disturbed by the Contractor's activities or as a result of the project, which are not to be restored with a pavement or aggregate surface, are to be restored with turf, unless specifically directed otherwise.

Turf shall be established on borrow areas and areas where excess soil is stockpiled.

When shown on the drawings or directed by the Engineer, the Contractor shall establish turf in other areas.

PART 2 - PRODUCTS

2.01 Materials

A. Topsoil

Topsoil shall be a humus-bearing, natural mineral soil of loam, sandy loam, silty loam, or clay loam classification. Topsoil shall neither be excessively acidic or alkaline.

Topsoil shall be screened and free of stones, roots, debris, and other foreign matter. Topsoil which is stripped from the project area shall be removed, transported, and stockpiled in a manner which prevents it from becoming mixed with sub-soils.

B. Fertilizer

Fertilizers shall be standard, commercial packaged or bulk products in granular or liquid form. Each container of packaged fertilizer shall be marked by the manufacturer with the following information: manufacturer name; lot number; date; analysis of contents, including the minimum percentages of total nitrogen, available phosphoric acid, and soluble potash; and the net weight. Bulk fertilizer shall be accompanied with an invoice indicating the manufacturer name; lot number; date; analysis of contents, including the minimum percentages of total nitrogen, available phosphoric acid, and soluble potash; and the net weight or volume.

Fertilizer for seeding and sodding shall be comprised of both a water insoluble component and a water soluble component. The water insoluble nitrogen must be from ureaformaldehydes and/or coarse grade isobutylidene diurea.

Fertilizer shall provide 33 pounds of actual water insoluble nitrogen per acre. The water soluble component of the fertilizer shall provide 65 pounds of actual nitrogen, phosphorus, and potassium nutrient per acre, in equal proportions. The water soluble component of the fertilizer shall include urea, diammonium phosphate, and potassium chloride.

C. Mulch

1. Loose Mulch

Mulch shall be straw or marsh hay, in an air-dried condition. Mulch material must be clean, undamaged, and rot-free. It must be substantially free of weed seed and other objectionable foreign matter.

2. Turf Mulch Blankets

Mulch blankets shall be manufactured by a company currently listed on the Michigan Department of Transportation's Qualified Products List.

Mulch blankets shall have a net covering on both sides of the blanket and shall be manufactured from either excelsior or straw. Excelsior blankets shall be manufactured from a uniform layer of interlocking excelsior fibers cut from sound, green timber, with an average dry weight of 12 ounces per square yard. Straw blankets shall be made of a uniform layer of clean wheat straw, free of weeds and weed seed, with the straw and net covering securely stitched together to form a uniform mat having an average dry weight of 8 ounces per square yard.

3. Mulch Anchoring

Mulching anchoring shall be manufactured by a company currently listed on the Michigan Department of Transportation's Qualified Products List.

Latex-based anchoring shall have a composition, by weight, of 48 percent styrene, 50 percent butadiene, and 2 percent additive, 42 percent to 46 percent solids, and a pH of 8.5 to 10.

Recycled newsprint mulch shall be comprised of specifically prepared, biodegradable, shredded newspaper particles consisting of recycled newsprint fibers. The recycled newsprint must contain a wetting agent, defoaming agent, and nontoxic dyestuff that will impart a bright green or blue color. The dyestuff must adhere tightly to the fiber. Recycled newsprint shall meet the following minimum requirements:

Moisture content (total weight)	12 percent maximum
Shredded high-grade newsprint (oven dry)	96 percent minimum
Tackifier, by weight	1½ percent to 3 percent
Water holding capacity (water per 3½ ounces of fiber)	32 ounces minimum

Wood fiber shall be specially prepared, biodegradable, air-dried virgin wood fibers manufactured from 100 percent whole wood chips. The wood fiber must be manufactured with a tackifier. Recycled materials are not acceptable. The fibers must be dyed with a green or blue biodegradable dye to aid in visual metering during construction. The process and materials must not contain growth or germination inhibiting materials. The wood fiber must conform to the following specifications:

Moisture content (total weight)	12 percent maximum
Organic wood fiber (oven dry)	95 percent minimum
Tackifier, by weight	3 percent to 5 percent
Water holding capacity (water per 3½ ounces of fiber)	35 ounces minimum

Guar gum tackifiers shall contain a minimum of 95 percent guar gum by weight. The remaining components shall be dispersing and crosslinking additives.

Other tackifiers may include water soluble natural vegetable gums, or guar gums blended with gelling and hardening agents, or a water soluble blend of hydrophilic polymers, viscosifiers, sticking aids, and other gums.

4. Mulch Netting

Netting shall have a mesh size not larger than 1½ inches by 2 inches and not smaller than ½-inch by ½-inch. The netting shall be fabricated from a plastic formulated from or treated with a chemical which will promote the breakdown of the net within the first growing season after its placement. The net shall have sufficient strength to hold the mulch in place and still deteriorate rapidly upon exposure to sunlight. Steel staples or pins shall not be used for anchoring of netting.

D. Sod

Sod shall be a densely rooted blend of at least 2 bluegrass varieties with 15 percent to 30 percent creeping red fescue content, reasonably free from weeds and grown on soil that is the same or similar to the topsoil at the project site. Sod shall be selected which will adapt well to the topsoil and ambient conditions at the project site and considering future maintenance.

Before sod is cut, the grass shall be mowed to a maximum height of 4 inches above the ground. The sod must be cut at least ¾-inch thick to retain the dense root system of the grass and to allow handling without undue tearing or breaking. When sod is cut in strips, it must be cut in small, uniform units approximately 1½ feet by 6 feet, or in such widths and lengths that can be handled without tearing or breaking. Sod may be cut, transported, and laid in large rolls.

E. Weed Control

Herbicides must be approved for use by the Michigan Department of Agriculture and the U.S. Environmental Protection Agency.

2.02 Seeding Mixtures

Seed shall be furnished in durable bags, each with a tag indicating the seed supplier, lot number, date, mixture proportions, purity, germination, and net weight.

Seed mixtures shall meet the requirements of one or more of the following mixtures, or other mixtures that are approved in advance by the Engineer. Where the Contractor believes that another mixture is appropriate for areas within the limit of the project, the Contractor shall request that the Engineer review and approve the substituted mixture(s). Requests for substitutions shall include the name of the seed supplier, the mixture proportions, the purity, and the germination.

Species	Purity, Minimum (percent)	Germination (percent)	Seed Mixture						
			Mixture Proportions (percent by weight)						
			TDS	THV	TUF	TGM	THM	CR	TSM
Kentucky Blue Grass	98	85	5	15	10	10	30		
Perennial Ryegrass	96	85	25	30	20	20	20		50
Hard Fescue	97	85	25		20	30			
Creeping Red Fescue	97	85	45	45	40	40	50		
Fults Salt Grass	98	85		10	10				
Cereal Rye	85	85						100	
Spring Oats	85	85							50

PART 3 - EXECUTION

3.01 Preparation for Turf Establishment

A. Topsoil Stripping

Prior to performing any excavation, filling, grading, or other earthwork, the Contractor shall

strip and stockpile topsoil for later use on the project. Excess topsoil shall not be removed from the project site unless specifically provided elsewhere in the contract documents.

B. Finish Grading

The areas that are to be seeded shall be properly graded, sloped, and shaped with an allowance for the thickness of the topsoil layer. The earth bed upon which topsoil will be placed shall be friable to a depth of at least 4 inches. Earth beds not in a friable condition shall be harrowed with a disk, spring tooth drag, or similar equipment.

C. Placement and Preparation of Topsoil

Topsoil shall be spread on the prepared areas to a depth of 4 inches (in place, after rolling or compaction), unless otherwise shown on the plans or proposal. After spreading, any large clods or lumps shall be broken and all stones larger than 1-inch diameter, rocks, roots, litter, and other foreign debris shall be raked up and disposed of by the Contractor. After spreading and raking, the topsoil surface shall be in a friable condition and the surface shall be reasonably close to the proposed grades and cross section.

The topsoil surface shall be shaped to provide proper drainage. Where proposed grades are not shown on the plans, the topsoil surface shall be graded to provide a smooth transition between the new construction and the existing, adjacent ground.

Excess topsoil shall be stockpiled in a location acceptable to the Owner and neatly trimmed to present a neat appearance.

3.02 Turf Establishment

A. Permanent Seeding and Fertilizing

Disturbed areas shall be seeded upon completion of earthwork and grading operations. Disturbed areas shall be stabilized with temporary seeding if permanent seeding cannot be completed.

Seed mixtures for permanent seeding shall be appropriate for the soil type and location, as indicated in the following table. The Contractor may propose and submit alternative mixtures to the Engineer for review and approval. It is the Contractor's responsibility to provide turf areas which are substantially free of bare spots and generally weed-free.

Mixture Designation	Soil Type	Location
TDS	Dry Sandy to Sand Loam	Rural or Urban
THV	Heavy	Rural
TUF	All Types	City Streets
TGM	Medium to Heavy	All
THM	Loamy to Heavy	Residential / Commercial

Fertilizer and seed shall be applied uniformly on areas prepared for seeding. Seed shall be applied at a rate of 220 pounds per acre. Seed and fertilizer may be applied by drilling, broadcasting, or hydraulically. Seed and fertilizer shall be applied before applying mulch. Seed and fertilizer shall be lightly raked or rolled into the prepared topsoil surface.

Neither broadcast seeding nor hydraulic seeding shall be performed during windy weather.

There shall be provisions for mixing or agitating the seed – fertilizer mixture used for hydraulic seeding to keep it evenly distributed in suspension. Mixtures shall be applied within an hour of mixing the seed with water; unused portions shall be discarded.

B. Sodding

Areas to be sodded shall be prepared by grading the area to the desired elevations and contours, less the depth of the topsoil surface and thickness of the sod. Three inches of screened topsoil shall be provided. The topsoil shall be conditioned by harrowing prior to laying the sod. In sloped areas, the harrowing shall be perpendicular to the slope.

The earth bed shall be thoroughly watered just before laying the sod. Sod shall be laid within 24 hours after cutting and shall be properly protected until it is placed. Sod that has been allowed to dry out will not be accepted. Sod shall not be placed on frozen soil, nor shall sod be frozen.

Sod strips shall be placed parallel with the flow of water on slopes and in ditches. The short ends of strips shall be staggered. Strips shall be placed with tight joints. Sod shall be laid starting at the base of the slope and progress upward. The edges of sodded areas shall transition by turning the edges of the sod into the ground and covering the edge with earth (or aggregate if adjacent to a road or pavement) and compacting the covering so that runoff is directed onto the sod. Sod placed adjacent to paved surfaces shall be firmly butted against and level with them.

Sod shall be firmly compacted by tamping it immediately after its placement to provide a surface even, smooth, and free of bumps and depressions. The Contractor shall thoroughly water sod following its placement, and periodically until it has become established.

C. Temporary Seeding

Temporary seeding shall be completed when the permanent seeding cannot be completed because of seasonal conditions. Temporary seeding shall be applied at a rate of 100 pounds per acre, and shall be of the following designation.

Mixture Designation	Soil Type	Location
CR	All Types	Temporary, less than 6 months
TSM	All Types	Temporary, more than 6 months

Before completion of the contract, the Contractor shall complete permanent seeding of all areas which are temporary seeded.

D. Dormant Seeding

Dormant seeding should be used only when necessary to complete a project when seasonal conditions are not conducive to permanent seeding. Dormant seeding shall not be completed on frozen ground. Dormant seeding shall be completed, as required, for permanent seeding.

The Contractor is responsible to establish turf which is substantially free of bare spots and generally free of weeds.

3.03 Mulching

A. Mulch Placement

Immediately after the seed has been set into the topsoil surface by light raking or rolling, the Contractor shall spread mulch and anchor it as appropriate. Mulching shall not be performed during windy conditions.

Loose mulch shall be placed thick enough to shade the ground, conserve moisture, and resist erosion, but open enough to allow sunlight to penetrate and air to circulate.

The Contractor shall maintain mulched areas and repair any areas where damage from erosion, wind, traffic, fire, or other causes occur.

Mulch shall be applied at a uniform rate of 2 tons per acre, except that a rate of 3 tons per acre is required with dormant seeding.

B. Mulch Anchoring

Mulch anchoring (tackifiers) shall be sprayed immediately after the mulch is placed. Spraying shall not be performed when wind might prevent the proper placement of the adhesive. The Contractor shall provide protection measures, as necessary, to protect traffic, signs, structures, and other objects from being marked or disfigured by tackifier materials.

Latex based adhesive shall be mixed at a rate of at least 15 gallons of adhesive with a minimum of 250 pounds of recycled newsprint and 375 gallons of water.

Recycled newsprint shall be mixed at a minimum rate of 750 pounds of newsprint with 1,500 gallons of water.

Wood fiber shall be mixed at a minimum rate of 750 pounds of wood fiber with 1,500 gallons of water.

Guar gum shall be mixed at a minimum rate of 100 pounds of dry adhesive and a minimum of 250 pounds of recycled newsprint and 1,300 gallons of water.

Other tackifiers shall be mixed at a minimum rate of 100 pounds of dry adhesive with a minimum of 250 pounds of recycled newsprint with 1,300 gallons of water.

C. Mulching Netting

When netting is used to secure mulch, it shall be secured with anchors, staples, or pins. The net shall be spread over the mulch so that a worker can walk between adjacent widths of the net. The edges of adjacent widths of net shall be pulled together and held in place with net anchors. Net anchors shall be spaced not more than 30 inches apart along the edges, joints, and centerline. The net shall not be installed in direct contact with the ground. If the Contractor elects to use mulch netting or blankets, the Contractor will be required to remove the netting fabric once the turf is established.

D. Mulch Blankets

Mulch blankets shall be installed within one day of seeding. The side edges of blankets shall be overlapped by 2 inches. Blanket ends shall be shingle lapped 6 inches. Non-metallic staples or pegs shall be placed along all joint edges and along blanket centerlines at a maximum spacing of 2 feet. Blankets in waterways shall be shingle lapped 12 inches on the downslope edge. If the Contractor elects to use mulch netting or blankets, the Contractor will be required to remove the netting fabric once the turf is established.

High velocity blankets shall be installed on slopes of 1:2, or steeper, on ditch bottoms, on ditch side slopes (to an elevation 1 foot above the ditch bottom), and where specifically shown on the drawings or directed by the Engineer.

3.04 Weed Control

Weed control shall be provided by the Contractor, as necessary, to develop turf areas which are relatively free of weeds. Herbicides shall be applied in accordance with federal, state, and local regulations. Herbicides shall be applied in accordance with manufacturer's instructions. Herbicides shall be applied by commercial applicators, licensed in the State of Michigan and certified by the Michigan Department of Agriculture in the appropriate category(ies).

Target weeds shall be sprayed in the newly seeded turf when the new turf grass is sufficiently established to withstand the application of herbicide. Herbicide application shall be repeated if the first application failed to control target weeds.

The Contractor shall take appropriate measures to preserve and protect adjacent property from damages resulting from the application of herbicides. Herbicides shall not be applied when wind may carry it to adjacent areas.

END OF SECTION

SECTION 33 05 00
ADJUSTING STRUCTURES

PART 1 - GENERAL

1.01 Work Included

This work provides for the vertical adjustment of existing manholes, catch basins, drainage inlets, valve boxes, curb stops, and monument boxes to fit the proposed finish surface. This work includes the temporary lowering of manholes and drainage structures.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ASTM A48 – Standard Specification for Gray Iron Castings
- B. ASTM C55 – Standard Specification for Concrete Building Brick
- C. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- D. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
- E. Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

- A. Section 01 45 16.01 – Concrete Testing
- B. Section 01 45 16.02 – Density and Aggregate Testing

1.04 Traffic Protection

Vehicular and pedestrian traffic shall be protected from excavations left around structures, structures which have been raised above the level of the adjacent pavement or ground surface, or other hazards by one of the following methods:

- A. Placing and maintaining appropriate barricade(s) at each hazard.
- B. Placing a temporary ramp (HMA on pavement areas, soil or aggregate in non-pavement areas) to provide a smooth transition over the structure.

1.05 Local Standards

All work shall conform to the standards and requirements of the agency(ies) having jurisdiction over the utilities (owning the structures to be adjusted) and the streets or roads (where the utilities are located). Some of the materials or methods described in these specifications may not comply with local standards.

PART 2 - PRODUCTS

2.01 Materials

A. Precast Concrete Grade Rings

Precast grade rings shall be constructed in accordance with ASTM C478. Grade rings shall be of a thickness to provide for adjustment to the required grade.

B. Precast Manhole Sections

Precast manhole sections shall be constructed in accordance with ASTM C478. The diameter, height, thickness, and dimensions shall be as necessary to fit the existing structure and provide for its adjustment to the required elevation.

C. Masonry

Masonry shall be solid concrete bricks or blocks. Bricks shall meet ASTM C55, Grade S-II. Blocks shall be curved, with the inside and outside radii parallel, and of an appropriate diameter for the manhole or drainage structure. Block dimensions shall be chosen to provide the required transition to the existing structure and provide the required adjustment to the final elevation.

D. Castings

Castings for manholes, drainage structures, valve boxes, and monument boxes shall be constructed of gray iron, conforming to ASTM A48, Class 35B. All surfaces of the castings shall be coated with asphaltic paint. The coating shall be smooth, tough, and tenacious when cold, and must not be tacky or brittle.

Lids and frames shall be machined so the lid seats firmly into the frame without rocking.

2.02 Mixtures

A. Mortar

Mortar shall be a mixture of 1 part cement and 3½ parts granular material (MDOT 2NS). A sufficient quantity of water shall be added to attain the consistency necessary for the work.

PART 3 - EXECUTION

3.01 Adjusting Manholes, Catch Basins, and Drainage Inlets

Structures within paved areas shall be adjusted to the final elevation placement of the final course of HMA (if located within an area of HMA surface) or prior to placement of the concrete (if located within the curb, sidewalk, or driveway).

A. Structure Adjustment in Curb, Sidewalk, or Driveway

Pavement, aggregate, and/or earth around the structure shall be excavated and removed sufficiently for completing the work.

The existing casting of manholes, catch basins, and drainage structures which are to be adjusted shall be carefully removed and protected by the Contractor. Any unsound masonry or concrete in the walls of the manholes, catch basins, and drainage structures shall be

removed. If the elevation of the structure's casting is to be lowered, the wall of the existing structure shall be lowered sufficiently so that when re-installed, the casting will be at the proper elevation.

All materials and debris resulting from the demolition and removal of unsound material shall be kept from falling into the sewer pipes, removed from inside of the manholes or structures, and disposed of properly by the Contractor.

Where casting elevations are to be raised or where structure walls need to be rebuilt to replace unsound material, the structure walls shall be built to the required elevation with an allowance for the height of the casting. The walls may be constructed with concrete masonry or precast concrete grade rings or manhole sections.

Following adjustment of the structure, the excavated area shall be filled with aggregate or HMA and compacted according to Section 01 45 16.02 – Density and Aggregate Testing, or concrete to their respective original levels, or to the elevation of the bottom of the final pavement course.

Following placement of the final pavement course, no part of the casting shall extend above the finished surface; the surface of the pavement shall not be greater than 0.02 feet above the top of the casting.

B. Concrete Masonry

Concrete masonry shall be constructed when temperatures are above freezing, including a cure time of at least 24 hours. The first row of blocks shall be laid on a full bed of mortar on a sound, level course of existing masonry or the concrete base. Blocks shall be laid in level courses with ½-inch joints, except where otherwise approved by the Engineer. Joints shall be finished so that the exposed surface is true and smooth. A ½-inch plaster coat shall be provided over the exterior of the block surface. The blocks shall be wetted and joints raked before applying the plaster coat.

C. Precast Concrete Grade Rings and Manhole Sections

Joints for sanitary sewer manholes shall be rubber O-ring type, meeting the requirements of ASTM C443. Joints for storm manholes, catch basins, and inlets shall be bituminous mastic.

D. Metal Ring Adjuster

Where approved for adjustment of castings, a metal ring of appropriate dimensions may be inserted in the existing frame. The metal ring shall be secured to the existing frame.

3.02 Adjust Valve Boxes and Curb Stops

Valve boxes shall be adjusted to the final elevation following the completion of paving operations, other than the final paving course. Valve boxes shall be adjusted just prior to placement of the final course.

Pavement, aggregate, and/or earth around the valve box shall be excavated and removed sufficiently for completing the work.

Existing valve boxes shall be adjusted by sliding or twisting the upper section of the valve box to the required elevation. The valve box shall be securely supported so that the final installation is both plumb and at the required elevation. The excavated area shall be filled with earth, aggregate, or HMA, all compacted according to Section 01 45 16.02 – Density and Aggregate Testing and to their original levels.

Following placement of the final HMA course, no part of the box shall extend above the finished pavement; the surface of the pavement shall not be greater than 0.02 feet above the top of the box.

3.03 Adjust Monument Boxes

Existing monument boxes shall be removed prior to beginning construction. Prior to their removal, the Contractor shall notify the Engineer so that the existing survey point can be witnessed and location recorded for future re-establishment. The Contractor shall carefully remove the casting and store it in a safe place for re-use. If the existing casting is damaged prior to the Contractor's removal, the Contractor shall notify the Engineer at the time the damage is discovered.

Following paving operations, the Contractor shall core the pavement at the location for the monument box. The core hole shall have a diameter not greater than 1-inch larger than the diameter of the box. The box shall be grouted in place with a non-shrink grout mixture. No part of the box shall extend above the finished pavement; the surface of the pavement shall not be greater than 0.02 feet above the top of the box. The box shall be located so that the center of the box is not greater than 0.05 feet from the witnessed corner location.

END OF SECTION

SECTION 33 11 00
WATER MAIN

PART 1 - GENERAL

1.01 Work Included

The Contractor shall install water main and appurtenances in accordance with this specification. This work includes excavation, pipelaying, backfilling, and testing.

The Contractor shall protect existing utilities during construction, whether the existing utilities are shown on the plans or not. Utilities damaged by construction shall be repaired in a manner satisfactory to the Engineer and at the Contractor's expense. The Contractor shall call MISS DIG (800-482-7171) for staking and locating the existing utilities.

The water department will assist the Contractor in locating existing water service leads and mains.

The Contractor shall contact the water department to schedule work that may interfere with existing water service.

The Contractor shall develop a construction sequencing plan and submit to the Engineer and Owner for approval. The construction sequence shall minimize interruption of service.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ANSI A21.4/AWWA C104 – American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- B. ANSI A21.5/AWWA C105 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
- C. ANSI A21.11/AWWA C111 – American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- D. ANSI A21.50/AWWA C150 – American National Standard for Thickness Design for Ductile-Iron Pipe
- E. ANSI A21.51/AWWA C151 – American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water
- F. ANSI A21.53/AWWA C153 – American National Standard for Ductile-Iron Compact Fittings for Water Service
- G. AWWA C110 – Ductile-Iron and Gray-Iron Fittings
- H. AWWA C115 – Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
- I. AWWA C500 – Metal-Seated Gate Valves for Water Supply Service

- J. AWWA C502 – Dry-Barrel Fire Hydrants
- K. AWWA C504 – Rubber-Seated Butterfly Valves
- L. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service
- M. AWWA C512 – Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
- N. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
- O. AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances
- P. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
- Q. AWWA C651 – Disinfecting Water Mains
- R. AWWA C800 – Underground Service Line Valves & Fittings
- S. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution
- T. AWWA C904 – Crosslinked Polyethylene (PEX) Pressure Tubing, 1/2 In. (13 mm) Through 3 in. (76 mm) for Water Service
- U. AWWA C906 – Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
- V. AWWA C908 – Standard for PVC Self-Tapping Saddle Tees for Use on PVC Pipe
- W. AWWA C909 – Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 In. (100 mm) and Larger
- X. ASTM B88 – Standard Specification for Seamless Copper Water Tube
- Y. ASTM B251 – Standard Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
- Z. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- AA. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
- BB. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- CC. ASTM D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
- DD. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- EE. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- FF. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

- GG. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- HH. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
- II. ASTM F2080 – Standard Specification for Cold-Expansion Fittings with Metal Compression Sleeves for Crosslinked Polyethylene (PEX) Pipe and SDR9 Polyethylene of Raised Temperature (PE-RT) Pipe
- JJ. ASTM F2657 – Standard Test Method for Outdoor Weathering Exposure of Crosslinked Polyethylene (PEX) Tubing
- KK. ISO 9002 – Model for Quality Assurance in Production, Installation and Servicing
- LL. CSA B137.5 - Crosslinked Polyethylene Tubing Systems for Pressure Applications
- MM. DIPRA – Polyethylene Encasement Installation Guide
- NN. DIPRA – Thrust Restraint Design for Ductile Iron Pipe
- OO. NSF/ANSI Standard 14 – Plastics Piping System Components and Related Materials
- PP. NSF/ANSI Standard 61 – Drinking Water System Components-Health Affects
- QQ. Plastic Pipe Institute TR-3/2021/HDB/HDS/PDB/SDB/MRS/CRS Policies

1.03 Related Work

- A. Section 01 25 00 – Materials and Equipment
- B. Section 01 45 16.02 – Density and Aggregate Testing
- C. Section 01 71 23.16 – Construction Staking by Contractor
- D. Section 01 74 50 – Cleanup and Restoration
- E. Section 02 41 13.13 – Pavement Removal
- F. Section 31 10 01 – Clearing and Removal of Miscellaneous Structures
- G. Section 31 25 00 – Soil Erosion and Sedimentation Control
- H. Section 32 11 23 – Aggregate Base
- I. Section 32 12 16 – HMA Paving
- J. Section 32 13 00 – Concrete Curb and Gutter, Sidewalk, and Miscellaneous Pavement
- K. Section 32 15 00 – Aggregate Surface
- L. Section 32 92 00 – Turf Establishment

1.04 Submittals

Submit shop drawings or manufacturer's data to the Engineer for review and approval prior to ordering for the following:

- A. Hydrants
- B. Valves
- C. Pipe, including fittings and joints
- D. Restraints
- E. Curb stops, corporation taps, and curb stop boxes
- F. Tracer wire and splice connections
- G. Casing pipe
- H. Manholes, manhole adjusting rings, and castings
- I. Directional Bore

1. Work Plan

Prior to beginning work, the Contractor shall submit to the Engineer a work plan detailing the procedure and schedule to be used to execute the project. The work plan should include a description of all equipment to be used, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), an environmental protection plan, and contingency plans for possible problems. The work plan should be comprehensive, realistic, and based on actual working conditions for this particular project. The work plan should document the thoughtful planning required to successfully complete the project.

2. Equipment

Submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Equipment shall include, but not be limited to: drilling rig, mud system, mud motors (if applicable), downhole tools, guidance system, and rig safety systems. Calibration records for guidance equipment shall be included. Specifications for any drilling fluid additives that the Contractor intends to use or might use shall be submitted.

1.05 Quality Assurance and Quality Control

A. Leakage

The completed pipeline shall be subjected to a hydrostatic pressure test in accordance with Section 3.19.

B. Bacteriological

Following disinfection, a bacteriological test shall be completed in accordance with Section 3.19.

1.06 Local Standards

The Owner's standards for materials are shown on the plans. Where there is a conflict between the Owner's standards and the specifications, the Owner's standards prevail.

1.07 Directional Bore Contractor's Qualifications and Experience

All directional boring operations shall be done by a qualified directional boring Contractor, with at least five years of experience involving work of a similar nature to the work required of this project.

Notify the Owner and Engineer a minimum of three days in advance of the start of work.

All work shall be performed in the presence of the Owner or Engineer.

PART 2 - PRODUCTS

2.01 Materials

A. Pipe

Pipe may be any of the following materials, except where a specific material is indicated on the plans or in the proposal.

1. Ductile Iron Pipe (Thickness Class)

Ductile iron pipe shall meet ANSI A21.51/AWWA C151. Pipe shall be cement lined and shall meet ANSI A21.4/AWWA C104. Pipe wall thickness shall conform to ANSI A21.50/AWWA C150 and shall be of the following thicknesses, unless specifically noted otherwise on the plans or in the proposal:

Pipe Diameter (inches)	Pipe Class (psi)
4	52
6	52
8	52
10	52
12	52
14	54
16	54
18	54
20	54
24	54

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for buried pipe shall be either mechanical type or push-on type, in accordance with ANSI A21.11/AWWA C111. Working pressure shall be 350 psi. Provide electrical conductivity at each joint.

Joints for piping in structures shall be flanged.

Joints for directionally bored pipe shall be snap lock gasket style manufactured by Griffen, or as approved by the Engineer.

2. Ductile Iron Pipe (Pressure Class)

Ductile Iron Pipe shall meet the requirements of ANSI A21.51/AWWA C151. Pipe shall be cement lined and shall meet ANSI A21.4/AWWA C104.

Water main shall be of the class(es) indicated in the following table, unless specifically noted otherwise on the plans or in the proposal:

Pipe Diameter (inches)	Pressure Class (psi)
4	350
6	350
8	350
10	350
12	350
14	250
16	250
18	250
20	250
24	250

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for buried pipe shall be either mechanical or push-on type, in accordance with ANSI A21.11/AWWA C111. Working pressure shall be 350 psi. Electrical conductivity shall be provided at each joint.

Joints for piping within structures shall be flanged.

Joints for directionally bored pipe shall be snap lock gasket style manufactured by Griffen, or as approved by the Engineer.

3. Polyvinyl Chloride (PVC) Pipe

PVC pipe shall meet the requirements of AWWA C900. Pipe shall have a ratio of diameter to wall thickness (DR) of 14 (Pressure Class 305), for 6-inch thru 12-inch diameter pipe and DR 18 (Pressure Class 235) for pipe diameters larger than 12-inch, unless noted otherwise on the plans or on the proposal.

Pipe shall meet both NSF/ANSI Standard 61 and NSF/ANSI Standard 14. Pipe shall be marked with "NSF-PW" to indicate its compliance with these standards.

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for pipe shall be push-on type with elastomeric gaskets meeting the requirements of ASTM D3139.

4. Molecularly Oriented Polyvinyl Chloride (PVCO) Pipe

PVCO pipe shall meet the requirements of AWWA C909. Pipe shall be of the class(es) indicated in the following table, unless specifically noted otherwise on the plans or in the proposal:

Pipe Diameter (inches)	Pressure Class (psi)
6	305
8	305
10	305
12	305
16	165

Pipe shall meet both NSF/ANSI Standard 61 and NSF/ANSI Standard 14. Pipe shall be marked with “NSF-PW” to indicate its compliance with these standards.

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for pipe shall be push-on type with elastomeric gaskets meeting the requirements of ASTM D3139.

5. PVC Pipe for Directionally Bored Construction

PVC pipe shall meet the requirements of AWWA C900. Pipe shall have a ratio of diameter to wall thickness (DR) of 18, unless noted otherwise on the plans or on the proposal, and shall be suitable for directional boring, both pushable and pullable.

Pipe shall meet both NSF/ANSI Standard 61 and NSF/ANSI Standard 14. Pipe shall be marked with “NSF-PW” to indicate its compliance with these standards.

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for pipe shall be fusible or have a mechanical locking system suitable for directional boring. Gaskets (if applicable) shall be elastomeric meeting the requirements of ASTM D3139.

6. Polyethylene (PE) Pipe for Directionally Bored Construction

PE pipe shall meet the requirements of AWWA C906. Pipe shall have a ratio of diameter to wall thickness of 11 (SDR 11), unless noted otherwise on the plans or on the proposal.

Pipe shall meet both NSF/ANSI Standard 61 and NSF/ANSI Standard 14. Pipe shall be marked with “NSF-PW” to indicate its compliance with these standards.

The pipe manufacturer and class shall be marked on each length of pipe.

Joints for pipe shall be by thermal butt fusion per ASTM D2657.

B. Fittings

Fittings shall be mechanical joint or push-on type, either cast iron or ductile iron as follows: Cast iron fittings shall meet the requirements of AWWA C110 and shall be rated for 350 psi working pressure. Ductile iron fitting shall meet the ANSI A21.53/AWWA C153 and shall be Class 350. Fittings shall be cement lined in accordance with ANSI A21.4/AWWA C104. Rubber gasket joints shall meet ANSI A21.11/AWWA C111. Electrical conductivity shall be provided at

each joint.

C. Gate Valves

Gate valves shall meet the Owner's standards for manufacturer, style, and opening direction.

Gate valves shall be iron body, non-rising stem, resilient wedge type meeting the requirements of AWWA C509. Gate valves shall be designed for direct bury application.

Resilient seated valves shall meet the requirements of AWWA C509, thick wall valves shall meet AWWA C515.

D. Hydrants

Hydrants shall meet or exceed AWWA C502. Unless otherwise noted, hydrants shall have two 2½-inch hose nozzles and one 4-inch pumper nozzle, National Standard Threads, with all nozzles located 18 inches above ground level.

Nozzle caps shall be securely chained to the barrel. Hydrants shall be of the breakable flange type, such that neither barrel nor stem are damaged upon impact and that no water is lost. Hydrants shall be designed so that the direction of the nozzles can be changed by rotating the above-ground section.

Hydrant color shall be approved by Owner.

Hydrants shall be provided with a drain, which is plugged at the time of delivery. Hydrants are to be of the "dry top" design to prevent freezing.

If removal of the seat valve requires a special wrench, one shall be provided. The wrench shall operate the valve stem at the point of removal of the above-ground section.

Operating nut size, shape, opening direction and model shall be in accordance with the Owner's standards.

E. Copper Pipe

Copper pipe shall be constructed of Type K, soft temper copper tubing for underground use, in accordance with ASTM B88 and B251. The manufacturer and pipe type shall be marked on the outside of the pipe. The weight per foot of copper tubing shall meet or exceed that specified by ASTM B251, Table II.

F. Stops and Fittings

Corporation stops, curb stops, and fittings shall be fabricated of brass and shall be lead free.

For PVC pipe, any taps 2 inches or less shall be Style 202B saddle with stainless steel bands, as manufactured by Ford Brass or approved equal.

G. Service Boxes

Water services boxes shall be of a style conforming to the Owner's standard. Boxes shall be adjustable, a minimum of 6 inches above and below finish grade.

H. Valve Boxes

Valve boxes shall be made of good quality cast iron and shall be of the sectional type. The lower section shall be a minimum of 5 inches in diameter, enlarged at the base to fit around the bonnet of the valve. The upper section shall be arranged to slide or screw down over the adjoining lower section and shall be full diameter throughout. Valve boxes shall be provided with cast iron lids or covers. Lids or covers shall be marked "WATER". The over-all length of valve boxes shall be sufficient to permit the top to be set flush with the final ground surface grade. Valve boxes shall be as manufactured by Traverse City Iron Works, Clow Corporation, or equal.

I. Materials for Gate Wells

The manhole base, sections, and reducer shall be manufactured in accordance with ASTM C478, with rubber gasket conforming to ASTM C443. The manhole sections shall be provided with an 8-inch pre-cast base slab. Integrally cast wall and slab sections are required.

Precast riser rings shall be manufactured in accordance with Michigan Department of Transportation Standard Plan R-1-Series.

Adjusting rings shall be manufactured in accordance with ASTM C478.

Manhole steps shall be copolymer polypropylene plastic steps with a steel reinforcement bar, with a minimum diameter of ½-inch, a minimum width of 10 inches center to center of wall anchor, and complete with anti-skid side plates conforming to ASTM D4101. Steps shall be manufactured with the manhole wall and spaced at a maximum of 16 inches on center. Gray iron castings shall be heavy duty classification and shall conform to ASTM A48 Class 35B coated with asphalt coating.

Manhole frames and covers shall be EJ No. 104014 with 1040 AGS cover and covers shall be stamped "WATER" with 2-inch raised letters, or approved equal.

J. Tracer Wire

Tracer wire shall be designed and manufactured for the purpose of detecting buried utilities. Tracer wire shall be 12 AWG (minimum) copper wire coated with a 30 mil (minimum) polyethylene jacket. The Contractor shall use larger wire, when necessary, for installation without damage during bored installations.

K. Polyethylene Encasement

Polyethylene encasement shall be in tube and sheet form, fabricated from either linear low-density polyethylene film having a thickness of at least 8 mils or high-density, cross-laminated polyethylene film with a thickness of at least 4 mils.

PART 3 - EXECUTION

3.01 Alignment and Grade

The water mains shall be constructed at the alignment and grades indicated in the plans and specifications, except where changes are directed or approved by the Engineer. Fittings, valves, hydrants, and service connections shall be installed at the locations indicated on the drawings or in the specifications, except where field conditions warrant changes which are directed and approved by the Engineer.

Valves and hydrants shall be installed plumb. Valve operating stems shall be installed in a manner to allow for their proper operation.

3.02 Investigation

Prior to excavation, the Contractor shall call MISS DIG and shall contact utility agencies which are not part of the MISS DIG system to make arrangements for identifying the location of existing utilities in the project area. Where potential conflicts are suggested by the plans and/or the utilities' locations, the Contractor shall excavate and expose the existing utilities at least 100 feet in advance of pipelaying operations. Where the existing utilities may conflict with the proposed alignment and construction, the Contractor shall make such appropriate modifications to the alignment and grade, as necessary, to prevent a conflict. Changes to the alignment and grade shall be as directed and approved by the Engineer. Changes to the alignment and grade shall be completed by the Contractor at no additional cost to the project.

3.03 Excavation

The Contractor shall excavate all materials to the depths necessary to construct the water main as shown on the plans. Excavation shall include the removal of rock, dirt, abandoned pipelines, old foundations, stumps and roots, and similar materials encountered. Excavation of whatever material encountered shall be included in the contract unit prices for water main installation and will not be paid for separately.

Excavation shall be in accordance with Section 31 23 01 – Excavating and Backfilling.

3.04 Pipe Handling

Pipe shall be handled in such a manner as to prevent the ends from splitting, damages to the protective coatings, and other undesirable conditions. Pipe shall not be dropped, skidded, or rolled into other pipe. Repairs to damaged pipe must be approved by the Engineer.

3.05 Pipe Cutting

Pipe cutting shall be done in a neat and workmanlike manner, without damage to the pipe or lining, and as to leave a smooth end at right angles to the axis of the pipe. Cutting shall be done by an approved mechanical saw or cutter. Hydraulic squeeze cutters are not acceptable.

3.06 Pipelaying

Pipe located inside structures shall be rigidly supported.

Pipe laid underground shall be uniformly supported through its entire length on a 4-inch cushion of sand. A depression shall be carved out of the sand cushion to accommodate the pipe bells.

Pipe shall be inspected for defects, debris, or dirt while suspended in a sling prior to lowering it into the trench. Defective pipe shall be removed from the project site immediately. Lumps, blisters, and excess coal tar coating shall be removed from inside the bell and outside the spigot.

These areas shall be wire-brushed and wiped clean with a dry oil-free rag. No debris, tools, clothing, or other materials shall be allowed in the pipe.

Pipe shall be laid in a dry trench, with bell ends facing in the direction of laying. After placing a length of pipe in the trench, and after installing the gasket and applying the gasket lubricant, the spigot end shall be centered in the bell, and the pipe pushed home and brought to the correct line and grade. The pipe shall be secured in place by tamping sand around it. Precautions shall be taken to prevent soil from entering the joint space.

A watertight plug shall be inserted in the open end(s) of the pipe to prevent water, soil, animals, or other foreign matter from entering the pipe during the construction phase.

When it is necessary to deflect pipe from a straight line, either horizontally or vertically, the deflection shall not exceed the following values:

Nominal Pipe Size (inches)	PVC & PVCO "Push on" Joint Maximum Deflection (inches/18-foot length)	Ductile Iron "Push on" Joint Maximum Deflection (inches/18-foot length)	Ductile Iron Mechanical Joint Maximum Deflection (inches/18-foot length)
4	4	19	27
6	4	19	27
8	4	19	20
10	4	19	20
12	4	19	20
14	0	11	13
16	0	11	13
18	0	11	13
20	0	11	11
24	0	11	9

3.07 Jointing

A. Fittings

Mechanical and "push on" joints shall be installed in accordance with the joint manufacturer's recommendations. Copies of such recommendations shall be furnished to the Engineer prior to the start of construction.

Flange faces of flanged joints shall be thoroughly cleaned with a wire brush and the pipe carefully aligned. The gasket shall then be inserted between the flanges and the bolts and nuts installed. Tightening of the bolts shall be done evenly around the flange so as to uniformly distribute the stress carried by the bolts.

B. Butt Fusion

Joints for pipe shall be by thermal butt fusion per ASTM D2657. All joints shall be performed in accordance with the procedures recommended by the manufacturer.

3.08 Tracer Wire

A tracer wire shall be laid along the crown of any plastic pipes. The wire shall be attached to the top of the pipe in such a manner that it will not become displaced during construction and backfilling. Tracer wire shall be continuous (without splices) over each separate run. If wire is damaged or broken during installation, a new wire shall be installed by the Contractor. The wire shall be terminated in valve wells or boxes as approved by the Engineer.

3.09 Separation and Cover

Where the proposed water main crosses under an existing utility, the proposed water main shall be deflected above or below the existing utility in accordance with the following:

- A. Maintain a minimum depth of cover over top of proposed water main as shown on the drawings.
- B. Maintain at least 18 inches of vertical separation and 10 feet of horizontal separation between the outside of the proposed water main and the outside of a sewer, drain pipe, or catch basin lead.
- C. Maintain at least 1 foot of vertical separation between the outside of the proposed water main and the outside of an existing utility other than a sewer, drain or catch basin lead.
- D. When crossing an existing sewer, drain pipe, or catch basin lead, construct the proposed water main so that its joints are equidistant from the utility being crossed.

3.10 Hydrants and Valves

A. General

Hydrants and valves shall be located as shown on the plans or as otherwise directed by the Engineer. Failure by the Contractor to locate said hydrants or valves, as called for, may result in Contractor correcting the error at their own expense.

B. Setting Hydrants

Hydrant bowls shall be set on aggregate or concrete slab and braced to resist thrust. Hydrants shall be set perfectly plumb. Hydrant valves shall be located 2 feet from the hydrant, unless otherwise directed by the plans or Engineer.

Excavations for the construction of hydrants and hydrant leads shall be backfilled with sand and compacted. That portion of the excavation outside the 1:1 influence of an existing or proposed roadway, sidewalk, driveway, parking lot, structure, or railroad, and at least 12 inches above the pipe, may be backfilled with suitable excavated material, and compacted.

Hydrants shall be supplied with the correct bury height needed at each location. If the water main is deeper than the minimum bury depth for constructability purposes and the hydrant lead pipe elevation cannot be adjusted, the hydrant bury height will need to be increased or the hydrant shall have an extension installed accordingly.

C. Removal of Hydrants

Where shown on the plans or otherwise directed by the Engineer, the Contractor shall remove existing hydrants. The ground shall be excavated to the depth of the hydrant lead. The water main shall be "shut down" by the water department. The Contractor shall remove the

hydrant, lead, valve, and box. The fitting on the main shall be plugged and blocked. The excavation shall be backfilled with sand and compacted. The hydrant, valve, and box shall be delivered to the water department service yard. That portion of the excavation that is outside the 1:1 influence of the existing or proposed roadway, and at least 12 inches above the pipe, may be backfilled with suitable excavated material and compacted.

D. Setting Valves

Valves shall be examined by the Contractor prior to lowering in the trench. All nuts and bolts shall be checked to assure tightness.

Valves shall be installed with the valve closed, supported on two 2-inch by 6-inch by 18-inch hardwood blocks and vertically plumb. The valve box shall be set plumb and its axis shall be in line with the stem. Valve boxes shall have the ability for future adjustments of up to 6 inches, above or below grade.

E. Cutting-in Valves

Where shown on the plans or directed by the Engineer, the Contractor shall install a new valve on an existing line. The existing main shall be uncovered by the Contractor. A section of the existing main shall then be cut out. The length will vary depending on the valve and sleeve dimensions. A suitable mechanical joint cutting-in sleeve shall be slid over one end of the pipe, and a gate valve installed over the other end. After the gate valve is in the "home" position, the sleeve shall be slid into the gate valve. The gaskets shall be positioned and the mechanical joints shall be tightened to the manufacturer's specifications. The valve shall be plumb. Provide support under the valve by placing two 2-inch by 6-inch by 18-inch hardwood boards. The completed installation shall be visually inspected for leaks before the pipe is covered. The valve box shall be installed over gate valve and adjusted to the proposed grade. The excavation shall be backfilled with sand and compacted. That part of the excavation that is not within the 1:1 influence of an existing or proposed roadway or railway, and at least 6 inches above the water main, may be backfilled with suitable excavated material and compacted.

F. Reconnection of Existing Hydrants

Where the plans call for reconnection of an existing hydrant to a new main, the Contractor shall excavate, as necessary, to locate the existing hydrant lead. The lead shall be cut in a location, directed by the Engineer. The Contractor shall then connect the hydrant to the new main by the use of sleeves, tees, elbows, 6-inch ductile iron pipe, and a 6-inch gate valve and box, as conditions require. The excavation shall be backfilled with sand and compacted. That portion of the excavation outside of the 1:1 influence of an existing or proposed roadway or railroad may be backfilled using suitable excavated material and compacted.

3.11 Polyethylene Encasement

All ductile iron fittings and hydrants below grade shall be wrapped with polyethylene encasement. Installation shall be as set forth in ANSI A21.5/AWWA C105 and DIPRA's "Polyethylene Encasement" brochure.

3.12 Thrust Restraint

All tees, plugs, bends, hydrants, offsets, and similar fittings shall be mechanically restrained or

braced to undisturbed ground by use of concrete thrust blocks.

Concrete for use as thrust blocks shall have a 28-day compressive strength of not less than 3,000 psi. The thrust block shall be placed so that the pipe, valve, hydrant, or fitting joints are accessible for repair. Details of placement of thrust blocks are shown on the plans. Vertical bends will require blocking and strapping as shown on the plans.

Restrained joints shall be designed in accordance with DIPRA *Thrust Restraint Design for Ductile Iron Pipe*. The following restraint joint systems are approved for ductile iron pipe, when observed by the Engineer.

Pipe Size	Restrained Joint Type
12 inch or less	Field Lok, Fast Grip
16 inches or larger	FlexRing, TR Flex

Restrained joints for PVC and PVCO pipe shall be as follows:

- A. MEGALUG by EBAA Iron, Series 19MJ00 or approved equal for mechanical joint restraints.
- B. MEGALUG by EBAA Iron, Series 1900 or approved equal for push joint/bell restraints.

Restrain all mechanical joints with retainer glands. Restraint all joints within length(s) according to restraint schedule, as determined using EBAA Iron Restraint Length Calculator.

Restrained joints are considered included in work of water main construction and will not be paid for separately.

3.13 Connection of Polyethylene to Fixed Appurtenances for Fittings

All connections where PE water main is transitioned to a different type of piping material or fitting, the pipe shall be anchored in concrete at the connection of the PE to the existing or proposed line or fitting. Concrete for use as anchor blocks shall have a 28-day compressive strength of not less than 3,000 psi. A flanged HDPE fitting shall be butt fused at the location of the transition of differing materials and encased in concrete.

3.14 Water Services

Water services shall be constructed where shown on the plans or where directed by the Engineer.

Water service pipe shall be connected to the water main through a brass corporation stop.

Water service pipe shall be connected to the water main through a service clamp or saddle (except where direct tapping is permitted) and brass corporation stop. The water main shall be under pressure during the tapping process. The pipe shall be drilled and tapped to the appropriate size for the connection being installed. The service clamp or saddle shall provide full support around the circumference of the pipe, and have a bearing area of sufficient width along the length of the pipe so that the pipe will not be distorted when the saddle is tightened. U-bolts will not be permitted.

Ductile iron pipe may be direct tapped in accordance with the following tables. Direct taps shall be drilled and tapped under pressure by use of a tapping machine with a combination drill and tap of the appropriate size for the connection being installed.

Minimum DIP Thickness Class Required for Direct Tapping					
Water Main Diameter (inches)	Tap Size				
	¾"	1"	1¼"	1½"	2"
4	53	55			
6	51	53	55		
8	50	52	53	55	
10	50	51	52	53	
12	50	50	51	52	55
16	50	50	50	50	54
20	50	50	50	50	52
24	50	50	50	50	50

Minimum Pressure Class of DIP Required for Direct Tapping					
Water Main Diameter (inches)	Tap Size				
	¾"	1"	1¼"	1½"	2"
4					
6					
8	350				
10	350				
12	350				
16	250	250	250	300	350
20	250	250	250	250	250
24	250	250	250	250	250

PVC and PVCO pipe shall not be direct tapped. Services 2 inches and under shall utilize a service saddle.

The maximum service connection for PVC and PVCO pipe is 2 inches.

After tapping the main and installing the corporation stop, the tap shall be tested by turning the corporation on and off. Any leakage detected visually shall be corrected by the Contractor.

The water service pipe shall be laid such that there is at least 24 inches of slack in the service line at the main. In other words, the first 3 feet of trench adjacent to the main shall have at least 5 feet of service lead pipe laid in it.

All joints of copper pipe shall be flared joints. After the copper pipe is in place and connected to the curb stop, the line shall be visually checked for leaks by closing the curb stop and opening the corporation stop.

The Contractor shall leave the corporation stop in the open position, unless directed otherwise by the Engineer.

The excavation resulting from water service pipe construction or reconnections and within the 1:1 influence of a roadway, driveway, sidewalk, parking lot, railroad, or other structures shall be backfilled by the Contractor with sand and compacted. Excavations not within the 1:1 influence of structures or paved surfaces may be backfilled with suitable native soils and shall be compacted.

Water service pipe shall be buried to the depth shown on the plans for water main depth, unless otherwise directed by the Engineer.

3.15 Conflicts with Existing Utilities

Excavation shall be made sufficiently in advance of pipelaying operations so that water main alignment can be adjusted to go above, below, or around existing pipes, structures, cables, or other obstacles that are encountered. Where such minor adjustments are made to the water main alignment, no additional compensation will be due to the Contractor.

Where existing electric cables, telephone cables, gas mains, or services are damaged, repairs shall be at the Contractor's expense. The repairs shall be made by the appropriate utility.

Where sewer leads are damaged, they shall be repaired by the Contractor at no charge to the Owner. Sewer leads shall be repaired with a section of schedule 40 PVC pipe of the size encountered. Pipe of the same material as that encountered can also be used. The damaged pipe shall be cut square and the "connection" area shall be thoroughly cleaned. Rubber gasketed sleeve couplings, suitable for connecting the pipe sizes and materials encountered, shall be furnished and installed by the Contractor for each reconnection or repair joint.

3.16 Conflicts with Proposed Utilities

This work consists of relocating a portion of existing water main or water service to avoid a conflict with a proposed utility. This work includes furnishing all labor, equipment, and materials required for excavation, installation, disinfection, and backfilling as shown on the plans and specified within this specification.

3.17 Restoration

Areas disturbed by construction activities shall be restored by the Contractor.

3.18 Testing and Disinfection

A. Hydrostatic Pressure Testing for Water Main

Water main shall be hydrostatically tested immediately after the section to be tested is installed. The Contractor shall provide all labor, equipment, and materials to perform the test, including pumps, gauges, plugs, corporations, water, miscellaneous pipes and fittings, and a means of measuring lost water. The testing equipment shall be approved by the Engineer.

The Contractor shall fill the main through hydrants or corporations. After completion of the tests, corporations made for the purpose of testing shall be plugged. Water shall be added to the line and air expelled to provide a pressure of 150 psig. When the Contractor has verified that all air is expelled and that the test pressure is maintained, the Contractor shall notify the Engineer to witness the test. The Engineer shall be given at least a 24-hour notice. The test duration shall be two hours. Water shall be added during the test period, as required, to maintain the required pressure to the highest point in the system throughout the test period. The amount of water required to maintain the test pressure is the actual leakage.

The actual leakage shall not exceed the allowable leakage as tabulated below:

Pipe Size (inch)	Allowable Leakage per 1,000 feet of Water Main (gallons/2 hours)
6	1.00
8	1.32
10	1.66
12	1.98
16	2.64
20	3.32
24	3.98

If unsatisfactory results are obtained, the Contractor shall locate and repair the leak and the system shall be retested.

B. Tracer Wire Continuity

The Contractor shall demonstrate continuity of the installed tracer wire to the Engineer.

C. Disinfection

The Contractor shall flush the water main with potable water until discharge from the main runs clear. The main shall be chlorinated in accordance with AWWA C651. After the chlorination procedure is completed, the water main shall be flushed again until the chlorine content is equal to that of the water being supplied. Sixteen hours or longer after the flushing, the Contractor may begin collecting samples for bacteriological analysis. Samples shall be collected at 24-hour intervals until two consecutive satisfactory results are obtained. Samples shall be collected at the end opposite the chlorine injection, except that in long lines or where contamination is suspected, the Engineer may require other sampling points. Sampling shall be performed under the observation of the Engineer.

Where satisfactory results are not obtained, the main shall be refushed, disinfected, and retested. Heavily chlorinated water shall be disposed of properly.

3.19 Abandoning Water Mains

Existing water main shall be abandoned where shown on the drawings or directed by the Engineer.

Water main that is to be abandoned shall be disconnected from the existing main which is to

remain in service. A suitable sized plug or cap shall be installed on the existing main to remain in service, together with suitable thrust restraint.

Where directed, the existing water main, together with any fittings and appurtenances, shall be removed in their entirety. The Contractor shall fill the excavation resulting from the excavation and removal of the pipe. Backfill within the 1:1 influence of pavements, roads, driveways, or structures shall be sand and compacted according to Section 01 45 16.02 – Density and Aggregate Testing. Backfill in other areas shall be suitable soil, free of rocks, debris, and frozen material and compacted according to Section 01 45 16.02 – Density and Aggregate Testing.

If the abandoned water main is to remain in place, the open ends of the pipe (or fittings) shall be bulkheaded. When designated on the plans or by the Engineer, the existing pipe shall also be filled with a lean grout mixture (flowable fill). The Contractor shall provide suitable openings in the pipe to fill the pipe and prevent the trapping of air. Fill shall be placed evenly to avoid displacing pipes or structures. Pipes and conduits within the fill area shall be secured to resist any movement resulting from buoyant forces.

END OF SECTION

SECTION 33 31 00
SANITARY SEWER

PART 1 - GENERAL

1.01 Work Included

The Contractor shall supply all labor, material, and equipment required for the installation and testing of gravity sanitary sewers and appurtenances in compliance with these general specifications, project specifications, and the contract drawings.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. ASTM A48 – Standard Specification for Gray Iron Castings
- B. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- C. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- D. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
- E. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
- F. ASTM C1479 – Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
- G. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
- H. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
- I. ASTM D2665 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
- J. ASTM D2680 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
- K. ASTM D3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- L. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- M. ASTM D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using

Flexible Elastomeric Seals

- N. ASTM D4101 – Standard Specification for Polypropylene Injection and Extrusion Materials
- O. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- P. ASTM F679 – Standard Specifications for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- Q. ASTM F1417 – Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
- R. ASTM F1668 – Standard Guide for Construction Procedures for Buried Plastic Pipe
- S. ANSI A21.4/AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
- T. ANSI A21.5/AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
- U. ANSI A21.10/AWWA C110 – Ductile-Iron and Gray-Iron Fittings
- V. ANSI A21.11/AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- W. ANSI A21.51/AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast
- X. ANSI A21.53/AWWA C153 – Ductile-Iron Compact Fittings
- Y. Michigan Department of Transportation 2020 Standard Specifications for Construction

1.03 Related Work

- A. Section 01 25 00 – Materials and Equipment
- B. Section 01 45 16.02 – Density and Aggregate Testing
- C. Section 01 71 23.16 – Construction Staking by Contractor
- D. Section 01 74 50 – Cleanup and Restoration
- E. Section 31 10 01 – Clearing and Removal of Miscellaneous Structures
- F. Section 31 25 00 – Soil Erosion and Sedimentation Control
- G. Section 32 92 00 – Turf Establishment

1.04 Submittals

The Contractor shall submit shop drawings or certificates of compliance to the Owner and Engineer for the following items.

- A. Pipe, fittings, and joint material
- B. Manholes and manhole adjusting rings and castings
- C. Pipe bedding and backfill material

1.05 Quality Assurance and Quality Control

A. Grade and Alignment

Grade and alignment shall be maintained using a laser. The Contractor shall verify that the sewer is constructed at the proper alignment by checking grades and offsets at each manhole, at 50 feet upstream from manholes, and at 100-foot intervals. The Contractor shall report as-constructed measurements to the Engineer.

B. Acceptance Tests

The completed sewer(s) shall be subjected to the following tests, prior to acceptance by the Owner. Acceptance tests shall be completed by the Contractor, in the presence of the Engineer (or Owner's representative).

1. Internal Video Inspection

The video inspection shall be completed in accordance with Section 3.10.A.

2. Infiltration Tests

The infiltration test shall be completed in accordance with Section 3.10.B.

3. Air Test

Air testing shall be completed in accordance with section 3.10.C.

4. Deflection Testing

All plastic sewers shall be subjected to a deflection test in accordance with Section 3.10.D.

5. Physical Inspection

The physical inspection shall be completed in accordance with Section 3.10.E.

PART 2 - PRODUCTS

2.01 Materials

All material supplied shall be new and shall be designed and guaranteed to perform the service required.

A. Pipe

Pipe shall be of the material, class and/or thickness indicated on the plans or on the proposal. If no specific materials or classes are provided on the plans or on the proposal, any of the following pipe materials are permissible.

1. PVC Pipe

All 3-inch diameter thru 15-inch diameter PVC pipe shall be ASTM D3034 gasketed sewer pipe with an SDR of 26 or lower. All PVC pipe with a diameter larger than 15-inch shall meet ASTM F679 with a pipe stiffness (PS) of 115. Pipe joints shall conform to ASTM D3212. Gaskets shall conform to ASTM F477. PVC pipe conforming to ASTM D1785 Schedule 40 and ASTM D2665 is acceptable for 6-inch service leads.

2. PVC Truss Pipe

Truss pipe shall conform to ASTM D2680. Pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, or other defects. Fittings shall conform to ASTM D2680 Section 7.1 and Tables 5 and 6. Joints shall be made with gasketed bell

coupling connections. Elastomeric seals (gaskets) shall meet ASTM F477 requirements.

3. Ductile Iron Pipe

Pipe shall be ductile iron Class 53, manufactured in accordance with the requirements of ANSI A21.51/AWWA C151. Push on joints for the pipe shall be in accordance with ANSI A21.11/AWWA C111. Pipe shall have cement mortar lining and seal coating in accordance with ANSI A21.4/AWWA C104.

Polyethylene wrap shall be in accordance with ANSI A21.5/AWWA C105 and shall be provided for all pipes except for those in manholes.

Fittings shall be mechanical joint or push-on type, either cast iron or ductile iron as follows: Cast iron fittings shall meet the requirements of AWWA C110 and shall be rated for 350 psi working pressure. Ductile iron fitting shall meet the ANSI A21.53/AWWA C153 and shall be Class 350. Fittings shall be cement lined in accordance with ANSI A21.4/AWWA C104. Rubber gasket joints shall meet ANSI A21.11/AWWA C111. Electrical conductivity shall be provided at each joint.

4. Reinforced Concrete Pipe

Where specified on the drawings, all sanitary sewers 18 inches or larger shall be reinforced concrete pipe conforming to ASTM C76, with joints conforming to ASTM C443. The size and class shall be as shown on the drawings. If the class is not shown on the drawings, Class III pipe shall be used when the cover over the pipe is 16 feet or less; Class IV pipe shall be used when the cover over the pipe is between 16 feet and 23 feet; and Class V pipe shall be used when the cover over the pipe is 23 feet or more.

B. Materials for Manholes

The manhole base, sections, and reducer shall be manufactured in accordance with ASTM C478 with rubber gaskets conforming to ASTM C443. The manhole sections shall be provided with an 8-inch pre-cast base slab for depths up to 20 feet and a 12-inch pre-cast base slab for greater depths. Integrally cast wall and slab sections are required. Manhole lifting holes shall not be permitted in the manhole sections. Lifting lugs shall be cast into the manhole for lifting.

Precast risers ring shall be manufactured in accordance with Michigan Department of Transportation Standard Plan R-1-Series.

Adjusting rings shall be manufactured in accordance with ASTM C478.

Manhole connection shall be cored openings with watertight, flexible rubber connectors meeting ASTM C923.

Manhole steps shall be copolymer polypropylene plastic steps with a steel reinforcement bar, with a minimum diameter of ½ inches, a minimum width of 10 inches center to center of wall anchor, and complete with anti-skid side plates conforming to ASTM D4101. Steps shall be manufactured with the manhole wall and spaced at a maximum of 16 inches on center. Gray iron castings shall be heavy duty classification and shall conform to ASTM A48 Class 35B coated with asphalt coating.

Manhole frames and covers shall be EJ No. 1040ZPT Type A solid cover, or Neenah Foundry Company No. R-1916-F, or approved alternate.

Manhole frames shall have anchor base flange holes furnished for bolting the frames to the cone section. Covers shall be equipped with four stainless steel cap screws countersunk flush with the cover. The frame and cover shall be connected to the cone section by use of 4 chromite coated $\frac{5}{8}$ -inch thread studs with washers and nuts, field cut bolts to proper length. All covers shall be stamped "SANITARY SEWER" with 2-inch raised letters.

C. Drop Connections

Pipe and fittings for drop connections shall be PVC or ductile iron.

2.02 Material Testing

All materials to be incorporated in the construction of gravity sewers and appurtenances shall be subject to inspection and tests, as specified by ASTM or AWWA references. The Owner reserves the right to subject any material supplied for a particular project to an independent testing laboratory. Such tests, if scheduled, shall be paid for by the Owner. The results of such tests shall be the basis of material acceptance.

The Contractor shall supply the Owner with shop drawings, a certificate of compliance, or actual test results stating that the material to be used is in conformance with the specifications prior to using material for construction.

PART 3 - EXECUTION

3.01 General

Sewers shall be constructed in accordance with the following standards, except as modified in this specification:

- A. Concrete Pipe: ASTM C1479
- B. Plastic Pipe: ASTM D2321 and ASTM F1668

3.02 Pipe Alignment

It shall be the Contractor's responsibility to transfer the line and grade to the bottom of the excavation for pipe laying. Lasers shall be used for pipe laying.

It shall be the Contractor's responsibility to protect the original survey control and benchmarks, as set by the Engineer.

3.03 Pipe Laying

Each pipe shall be laid on an even, firm bed, so that no uneven strain will come to any part of the pipe. Particular care shall be exercised to prevent the pipes bearing on the sockets. Bell holes for bell and spigot pipe shall be dug at each point as specified before. Each pipe shall be laid in the

presence of the inspector. The bell-end of the pipe shall be laid up-grade. Pipe laying shall proceed in the upstream direction, except where otherwise approved by the Engineer.

The interior of the sewer shall be cleaned of all dirt, debris, jointing material, and other material.

All pipe shall be completely pushed to the “home” position.

Pipes laid in tunnel or casing pipe shall be supported on suitable blocks, cut or grouted into position to place the invert of the sewer or drain at the slope, and to the elevations indicated on the contract drawings.

3.04 Connections to Existing Sewers

When replacing an existing sewer or manhole or constructing a new manhole over an existing sewer, the original sewer shall be reconnected to the new sewer or manhole. Existing sewer pipe shall be removed, salvaged, and reused to make connection to the new manhole, if possible. If existing pipe is not salvageable, a new sewer pipe shall be installed, as required, and connected to the existing sewer. When a new sewer is connected to an existing sewer, the existing sewer shall be removed to an existing joint, if existing joint is compatible with new sewer. If existing sewer joint is not compatible with new sewer, a watertight coupler shall be installed.

3.05 Pipe Joints

In all jointing operations, the trench must be dewatered when joints are made. Bell and spigot or tongue and groove ends of the pipe shall first be wiped clean before actual jointing operations are started.

Joints between consecutive bell and spigot or tongue and groove pipe shall be made with a rubber gasket. The gasket shall be fitted over the tongue or spigot of each pipe, as recommended by the manufacturer, and the pipe entered into the bell or groove and shoved home.

A. PVC Joints

All PVC pipe shall be joined with rubber compression gaskets that are factory installed. The joint shall be lubricated and joined so the “home” mark on the pipe is flush with the bell end.

B. Joints for Reinforced Concrete Pipe

Both the bell and spigot ends of the pipes to be joined shall be cleaned. The rubber joint shall be lubricated with material furnished by the joint manufacturer. The spigot end of the pipe shall be pushed “home” into the bell end of the receiving pipe.

3.06 Connections for Service Pipes

Service connections for house sewers shall be provided in the main sewers, as shown on the contract drawings or as designated in the specifications. The exact location shall be as directed by the Engineer during construction.

Either tee or wye branches are acceptable for service connections, where the main line sanitary sewer is 12 inches or greater. Wye fittings are required on 8-inch and 10-inch sewers. Service

leads shall be installed at a sufficient depth to service house basements if the main line sewer is sufficiently deep, but shall be left above the water table at their terminus.

The Contractor shall place a hardwood stake on the property line directly opposite each opening left in the sewer. The hardwood stake shall be 8 feet long and a minimum size of 2 inches by 2 inches. The Contractor shall locate and keep a record, in tabular form, of all manhole and sewer opening locations by measurement to the nearest downstream opening. All manhole locations shall be witnessed by at least two ties to existing topographic features. This record shall be delivered to the Engineer during the progress of the work. When constructing sanitary sewer connections in wet ground, place a 45-degree bend at the property end of the connection and install enough house lead to bring the connection above the natural ground water level.

For service connections where the main line is less than 10 feet deep, the Contractor need not supply a riser connection for the service lead. The service connection shall be left at a depth of 8 feet to 10 feet below the ground at the property line. The Contractor has the option of installing the house lead at an incline or using a riser section for sewers less than 10 feet deep.

When the invert of the sanitary sewer is in excess of 10 feet, a riser section shall be used to raise the service connection to a point approximately 10 feet below the surface of the ground. All service connections shall be installed in accordance with the standard details.

All openings shall be plugged with air tight stoppers.

Service leads on easements or adjacent to property lines shall extend one pipe length from the main line sewer, but not beyond the easement limit.

3.07 Manholes

All manholes shall be constructed at the locations shown and in accordance with the contract drawings. Manholes shall be constructed of precast wall sections with a rubber gasket in the joint. The precast top section shall be an eccentric cone. Precast bases shall be installed on the subbase in such a way as to provide a uniform bearing under the manhole. Manholes shall have either a precast integral bottom and channel or a field constructed channel. The steps and castings shall be constructed in accordance with the standard details on the construction drawings.

Holes shall be cored through the manhole for necessary pipe connections. Each pipe opening shall be provided with a resilient connector.

Openings into existing manholes (sewer tap), shall be made by a concrete drilling or coring machine. The opening shall be no larger than necessary for the new sanitary sewer. A watertight resilient connector shall be installed in the cored hole for the tapped sewer connection. The new tap shall be supported at the external side of the manhole with 6AA aggregate or concrete. The end of the tapped pipe shall be flush with the interior surface of the manhole. The existing flow channel shall be adjusted in accordance with the plan details.

Flow channels and/or drop connections shall be constructed as detailed on the construction drawings.

3.08 Acceptance Tests - Sanitary Sewers

The methods of testing shall be approved by the Engineer. The Contractor shall provide the necessary equipment and labor for making the tests, and the cost of testing and repair shall be included in the unit price bid for completed sanitary sewer. The Engineer shall determine when grouting or relaying of faulty pipe is required.

A. Infiltration Testing

Sewers 24 inches and larger shall be subjected to an infiltration test. Infiltration into the sanitary sewer shall be measured by use of an infiltration manhole where called for on the plans or by a V-notched sharp crested weir. The weir shall be furnished and installed by the Contractor, as directed by the Engineer. The joint shall be tight and visible leakage in the joints or excess of the specified amount shall be repaired at the Contractor's expense.

There shall be no allowable infiltration for PVC sanitary sewer pipe. The maximum amount of allowable leakage for other sanitary sewer pipe materials shall be limited to 100 gallons per inch diameter, per mile, per 24-hour day. The maximum allowable leakage shall be limited to 1,200 feet test length. The Contractor may elect to test longer sections of pipe, but the maximum allowable leakage shall be calculated based on a 1,200-foot test length. All testing shall be monitored by the Engineer.

B. Air Testing

Sewers less than 24 inches in diameter shall be subjected to an air test. The Contractor shall furnish all necessary labor, equipment, and supervision to perform the required air testing. The testing of PVC pipe sewer shall conform to ASTM F1417.

The Contractor shall be required to furnish the Owner with acceptable air test results for each segment of sanitary sewer. All testing shall be monitored by the Engineer.

The procedure for air testing of sewers shall be as follows:

The sewer line shall be tested in increments between manholes. The line shall be cleaned and plugged at each manhole. Such plugs shall be designed to hold against the test pressure and shall provide an air-tight seal. One of the plugs shall have an orifice through which air can be introduced into the sewer. An air supply line shall be connected to the orifice. The air supply line shall be fitted with suitable control valves and a pressure gauge for continually measuring the air pressure in the sewer. The pressure gauge shall have a minimum diameter of 3½ inches and a range of 0-10 psig. The gauge shall have minimum divisions of 0.10 psig and an accuracy of plus or minus 0.04 psig.

The sewer shall be pressurized to 4 psig, plus sufficient pressure to equal the force exerted by ground water over the pipeline. At least 2 minutes shall be allowed for the air pressure to stabilize between 3.5 and 4 psig. If necessary, air shall be added to the sewer to maintain a pressure of 3.5 psig or greater.

After the stabilization period, the air supply control valve shall be closed so that no more air will enter the sewer. The sewer air pressure shall be noted and timing for the test begun. The test shall not begin if the air pressure is less than 3.5 psig, or such other pressure as is

necessary to compensate for ground water level.

The time required for the air pressure to decrease 1 psig during the test shall not be less than the time shown in the following table:

Pipe Diameter (inches)	Minimum Test Time (minutes)	Pipe Length for Minimum Time (feet)	Time for Longer Pipe Length (seconds)
4	3:46	597	0.380 L
6	5:40	398	0.854 L
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470 L

Length is based on the length of the sewer main only. If laterals or other leads are connected, their lengths are not to be included in the testing length.

If a sewer fails to pass any of the previously described tests, the Contractor shall determine the location of the leaks, repair them, and retest the sewer. The tests shall be repeated until satisfactory results are obtained.

C. Deflection Testing

All sanitary sewers constructed using plastic pipe shall be subjected to a deflection test. The Contractor shall furnish all labor, materials, and equipment necessary to perform deflection testing. The testing shall be completed after the pipeline has been backfilled for a period of at least 30 days. The pipeline shall be tested with a rigid ball or mandrel having at least 7 points, and having a diameter of not less than 95 percent of the average inside diameter of the pipe being tested. The average diameter for the pipe will be as specified by the ASTM specification for the pipe material, class, and size. Where testing indicates that the pipe deflection exceeds 5 percent of the pipe diameter, the pipe shall be removed and replaced. Pipe that is replaced shall be re-tested at least 30 days following its replacement.

Deflection testing shall be performed in the presence of the Engineer. The Contractor shall provide the Engineer with a least two working days' notice of conducting deflection testing.

D. Physical Inspection

Upon completion of all work, the Contractor shall open all manholes in the presence of the Engineer to demonstrate that the manholes are complete and free of debris.

3.09 Bypass Pumping

Bypassing of the existing sewage shall be provided, as required, to maintain uninterrupted sanitary sewer service. The line shall be plugged at an upstream manhole and the flow shall be pumped to a downstream point or adjacent system. The pump and bypass lines provided shall be of sufficient size to handle the normal and peak flow conditions for the system. Internal

combustion engines shall have adequate exhaust silencers to muffle engine noise to an acceptable level for the area where located.

The bypass plan for each segment of pipe shall be submitted to the Owner and Engineer for review and approval prior to the start of the project, along with a list of equipment. All property owners affected by the bypass shall be notified by the Contractor a minimum of 48 hours in advance.

END OF SECTION

SECTION 33 44 00
STORM SEWERS

PART 1 - GENERAL

1.01 Work Included

This work includes construction of storm sewers, drainage structures, and appurtenances. Drainage structures include catch basins, inlets, manholes, and manhole tees.

1.02 References

Where materials or methods of construction are listed as being in conformance with a standard specification, it shall refer to the latest edition of the standard specification or any interim revision.

- A. AASHTO M36 – Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains
- B. AASHTO M170 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- C. AASHTO M294 – Standard Specification for Corrugated Polyethylene Pipe, 300-mm to 1,500-mm (12-in. to 60-in.) Diameter
- D. ASTM A48 – Standard Specification for Gray Iron Castings
- E. ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- F. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- G. ASTM C478 – Standard Specifications for Circular Precast Reinforced Concrete Manhole Sections
- H. ASTM D1056 – Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber
- I. ASTM D4101 – Standard Specifications for Polypropylene Injection and Extrusion Materials
- J. Michigan Department of Transportation 2020 Standard Specifications for Construction
- K. Michigan Department of Transportation Standard Plans
- L. All references to “Engineer” in this specification shall be interpreted as “Owner”. Owner will determine the involvement of the Engineer during construction.

1.03 Related Work

- A. Section 01 45 16.02 – Density and Aggregate Testing
- B. Section 01 71 23.16 – Construction Staking by Contractor

- C. Section 31 23 01 – Excavating, Filling, and Grading
- D. Section 31 25 00 – Soil Erosion and Sedimentation Control
- E. Section 32 92 00 – Turf Establishment

1.04 Quality Assurance and Quality Control

A. Grade and Alignment

Grade and alignment shall be maintained using a laser. The Contractor shall verify that the sewer is constructed at the proper alignment by checking grades and offsets at each manhole, at 50 feet upstream from manholes, and at 100-foot intervals. The Contractor shall report as-constructed measurements to the Engineer.

B. Acceptance Tests

The completed sewer(s) shall be subjected to the following tests, prior to acceptance by the Owner. Acceptance tests shall be completed by the Contractor, in the presence of the Engineer (or Owner's representative).

1. Physical Inspection

The physical inspection shall be completed in accordance with Section 3.07.

PART 2 - PRODUCTS

2.01 Materials

A. Pipe

Unless a specific type, class or thickness is called for on the plans or in the proposal, material class shall meet the requirements of Pipe Alternates for Storm Sewer Classes, as described in Section 402 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

1. Smooth-Lined Corrugated Plastic Pipe

Where storm sewers from 12-inch to 24-inch diameter are called for on the plans, with at least 3 feet of cover over the pipe, and when a particular kind of sewer pipe is not specified, the Contractor may furnish smooth-lined corrugated plastic pipe (SLCPP).

SLCPP shall be corrugated polyethylene pipe meeting the requirements of AASHTO M294, Type S. Any fittings required shall also meet the requirements of AASHTO M294. Only fittings supplied or recommended by the pipe manufacturer shall be used. When gaskets are used in couplings to provide watertight or silt-tight joints, gaskets shall be a band of expanded rubber meeting the requirements of ASTM D1056 for Type 2 closed cell rubber, or O-rings meeting the requirements of ASTM C443.

2. PVC Pipe

All PVC pipe shall be ASTM D3034 gasketed sewer pipe with a SDR of 26 or lower. PVC pipe conforming to ASTM D1785 Schedule 40 and ASTM D2665 is acceptable for 6-inch service leads.

B. End Sections

End sections shall be flared and beveled to conform with ditch slopes.

Metal end sections shall conform with AASHTO M36, where applicable. The metallic coating on the end sections shall be the same as on the pipe. End sections shall be furnished complete with coupling bands or hardware necessary for connecting them to the end of the pipe culvert.

C. Drainage Structures

Drainage structures shall be precast concrete units meeting the requirements of ASTM C478 with rubber gaskets conforming to ASTM C443. Drainage structures shall be 4 feet in diameter, unless shown otherwise on the plans or in the proposal. Precast concrete grade rings meeting ASTM C478 shall be used to adjust the top of the structure to the final grade. At least 6 inches, but not more than 18 inches, of vertical adjustment shall be provided with grade rings. Manhole lifting holes shall not be permitted in the manhole sections. Lifting lugs shall be cast into the manhole for lifting.

Manhole steps shall be copolymer polypropylene plastic steps with a steel reinforcement bar, with a minimum diameter of ½-inch, a minimum width of 10 inches center to center of wall anchor, and complete with anti-skid side plates conforming to ASTM D4101. Steps shall be manufactured with the manhole wall and spaced at a maximum of 16 inches on center. Gray iron castings shall be heavy duty classification and shall conform to ASTM A48 Class 35B coated with asphalt coating.

D. Castings

Castings shall meet the requirements of the Michigan Department of Transportation 2020 Standard Specifications for Construction, and the Michigan Department of Transportation Standard Plans.

PART 3 - EXECUTION

3.01 Excavation

Excavation shall be completed in accordance with Section 31 23 01 – Excavating, Filling, and Grading.

3.02 Pipelaying

Sections of sewer pipe shall be carefully laid in the prepared trench, bell ends upgrade, with the spigot end fully entered in the adjacent bell. Each section shall have firm bearing throughout its length and shall be substantially true to the line and grade required. The use of blocks to bring sections to grade will not be permitted.

Circular concrete pipe with lift holes shall be installed with the lift holes on top of the pipe. Holes shall be plugged with suitable concrete plugs before backfilling.

Existing live sewers that are to remain shall be carefully protected during construction of the new sewers. If they are damaged in any way, they shall be immediately repaired or replaced, as directed by the Engineer.

All junctions with house or building leads shall be made in a manner acceptable to the Engineer.

Flexible watertight joints shall be installed in accordance with the manufacturer's recommendations.

Connections to sewers owned by other agencies shall be done in accordance with their requirements.

Connections to existing sewers having a plug or bulkhead shall be made with a watertight joint. The plug or bulkhead shall be removed without damage to the sewer, and the plug material shall be removed from the sewer and properly disposed of.

If there are no openings in the existing pipe or structures at the point of connection, an opening shall be cut in the pipe or the structure sufficiently large enough to permit 3 inches of mortar to be packed around the entering pipe and the mortar pointed up smooth and flush with the inner wall. Pipe passing through pipe or structure walls shall be cut at the end to conform with the shape of the inside of the wall and to be flush therewith. On the outside of the pipe or structure, the entering pipe shall be encased with sufficient mortar to provide bearing under the pipe. Any existing pipe broken or cracked while making the connection shall be replaced at the Contractor's expense.

When replacing an existing sewer, connections to the original sewer or drain that are encountered shall be reconnected to the new sewer.

Sewers and drainage structures shall be reasonably free of accumulation of silt debris and other foreign matter at the time of final acceptance.

3.03 Backfill

Backfill shall meet the requirements of Section 31 23 01 – Excavating, Filling, and Grading.

3.04 Additional Requirements of Construction for SLCPP Sewers

SLCPP shall be installed in accordance with Section 3.01. and the additional requirements provided here.

Joints in SLCPP shall be wrapped with a 2-foot wide strip of non-woven geotextile filter fabric with a 1-foot lap at the fabric joint.

The installed pipe shall not be deformed such that any diameter is reduced by 5 percent or more. Deformed pipe shall be removed and replaced at the Contractor's expense. The completed pipeline shall be tested for deformation by the Contractor under the Engineer's supervision. The Contractor shall furnish a 9-point mandrel having a diameter equal to at least 95 percent of the

original uninstalled inside diameter of the pipe. The mandrel shall meet the Engineer's approval. Mandrel testing shall be performed no less than thirty calendar days after installation.

3.05 End Sections

End sections shall be attached to the ends of pipe, where directed. Metal end sections shall be used on metal pipe and on smooth lined plastic pipe. Concrete end sections shall be used on concrete pipe.

End sections shall be installed on firm ground. The slope adjacent to the end section shall be graded and shaped to meet the geometry of the end section.

End sections shall be installed in accordance with the Michigan Department of Transportation's Standard Plans R-95 Series.

3.06 Drainage Structures

Precast concrete units shall be placed on a 6-inch sand base, leveled, and thoroughly compacted. Joints shall be sealed with mortar. Joints shall be thoroughly wetted prior to sealing. The joints inside the structure shall be flush with the walls. Joints shall be completely filled with mortar.

Pipe or tile connections to concrete drainage structures shall extend through the structure wall and be cut flush with the inside surface. The opening around the pipe shall be neatly filled with mortar to prevent leakage.

Drainage structure covers shall be new and adjusted to the finish elevation using precast concrete grade rings. Covers shall be of the type called for on the plans. Covers and grade rings shall be set in full mortar beds.

Cover elevations given on the plans are for information only. The final elevation will be determined in the field, based on as-constructed conditions.

Drainage structures shall be maintained reasonably free of accumulations of silt, debris, and other foreign matter at the time of final acceptance.

3.07 Acceptance Tests - Storm Sewers

The methods of testing shall be approved by the Engineer. The Contractor shall provide the necessary equipment and labor for making the tests, and the cost of testing and repair shall be included in the unit price bid for completed storm sewer. The Engineer shall determine when grouting or relaying of faulty pipe is required.

A. Physical Inspection

Upon completion of all work, the Contractor shall open all manholes in the presence of the Engineer to demonstrate that the manholes are complete and free of debris.

END OF SECTION