



PROJECT MANUAL for
RACINE UNIFIED SCHOOL DISTRICT
(RUSD)
Horlick High School Trades Program
Building

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CONSTRUCTION SPECIFICATION SECTIONS TABLE OF CONTENTS

DIVISION 00 - CONTRACTING REQUIREMENTS

Section	00 24 13	Scope of Bids
---------	----------	---------------

DIVISION 01 - GENERAL REQUIREMENTS

Section	01 11 00	Description of the Work
Section	01 11 16	Work by Owner
Section	01 31 00	Project Management and Administration
Section	01 31 13	Project Coordination
Section	01 32 16	Construction Progress Schedule
Section	01 33 00	Submittal Procedures
Section	01 40 00	Quality Standards & Requirements
Section	01 42 16	Definitions
Section	01 64 00	Owner-supplied Components
Section	01 77 00	Project Closeout Procedures

DIVISION 02 - EXISTING CONDITIONS

Section	02 01 00	Maintenance of Existing Conditions
Section	02 41 91	Selective Building Demolition

DIVISION 03 - CONCRETE

Section	03 21 00	Reinforcing Steel
Section	03 30 00	Cast-In-Place Concrete

DIVISION 04 - MASONRY

Section	04 05 16	Masonry Mortars and Grouting
Section	04 21 13	Brick Masonry

DIVISION 05 - METALS

Section	05 50 00	Metal Fabrications
---------	----------	--------------------

DIVISION 06 - ROUGH CARPENTRY

Section	06 10 00	Rough Carpentry
---------	----------	-----------------

DIVISION 07 - THERMAL and MOISTURE PROTECTION

Section	07 21 16	Thermal Batt Insulation
---------	----------	-------------------------

DIVISION 08 - OPENINGS

Section	08 11 00	Flush Steel Doors
Section	08 36 16	Overhead Sectional Doors
Section	08 71 00	Door Hardware
Section	08 60 00	Skylights

DIVISION 09 - FINISHES

Section	09 29 00	Gypsum Board Assemblies
Section	09 91 13	Interior Painting
Section	09 91 23	Interior Painting

DIVISION 10 - SPECIALTIES

Section	10 44 16	Fire Extinguishers
---------	----------	--------------------

DIVISION 13 – SPECIAL CONSTRUCTION

Section	13 34 19	Metal Building Systems
---------	----------	------------------------

DIVISION 22 - PLUMBING

Section	22 05 00	Common Work Results for Plumbing
Section	22 05 23	General Duty Valves for Plumbing Piping and Equipment
Section	22 05 29	Hangers and Supports for Plumbing Piping and Equipment
Section	22 05 53	Identification for Plumbing
Section	22 07 19	Plumbing Piping Insulation
Section	22 11 10	Facility Natural Gas Piping
Section	22 11 16	Domestic Water Piping
Section	22 11 19	Domestic Water Piping Specialties
Section	22 11 23	Domestic Water Pumps
Section	22 13 16	Sanitary Waste and Vent Piping
Section	22 13 19	Sanitary Waste Piping Specialties
Section	22 34 36	Commercial High-Efficiency, Gas Domestic Water Heaters
Section	22 42 16	Commercial Lavatories and Sinks
Section	22 45 26	Eye / Face Wash Equipment

DIVISION 23 – HEATING, VENTILATING, and AIR CONDITIONING (HVAC)

Section	23 81 00	Decentralized Unitary HVAC Equipment
---------	----------	--------------------------------------

DIVISION 26 – ELECTRICAL

Section	26 05 00	Common Work Results For Electrical
Section	26 05 19	Low Voltage Electrical Power Conductors and Cables
Section	26 05 26	Grounding and Bonding For Electrical Systems
Section	26 05 29	Hangers And Supports For Electrical Systems
Section	26 05 33	Conduit and Boxes For Electrical Systems
Section	26 05 53	Identification For Electrical Systems
Section	26 09 23	Lighting Control Devices
Section	26 22 13	Low-Voltage Distribution Transformers
Section	26 24 16	Panelboards
Section	26 27 16	Electrical Cabinets and Enclosures
Section	26 27 26	Wiring Devices
Section	26 28 16	Enclosed Switches And Circuit Breakers
Section	26 51 00	Interior Lighting
Section	27 10 00	Structured Cabling
Section	28 31 11	Digital, Addressable Fire-Alarm System

DIVISION 27 - COMMUNICATIONS

Section	27 01 00	Communications
---------	----------	----------------

DIVISION 28 - ELECTRONIC SAFETY and SECURITY

Section	28 01 60	Electronic Security Management Systems (ESS)
Section	28 23 01	Video Surveillance System
Section	28 31 00	Fire Alarm System

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section	32 12 16	Asphalt Paving
Section	32 13 13	Concrete Paving

-- END OF CONTENTS --

DIVISION 00 - CONTRACTING REQUIREMENTS

Section 00 24 13 – Scope of Bids

PART 1 - GENERAL

- 1.01 ALTERNATE BIDS: In addition to providing a comprehensive Quotation for the Basic Scope of Contract Work, the General Contractor shall provide Quotations for two (2) Mandatory Alternate Bid Items. See Bid Form.
- A. ALTERNATE BID No. 1: **Skylights.**
1. Provide six (6) NORCO curb-mounted prismatic Skylights as part of the Pre-Engineered Metal Building package
 2. See Specifications Section 13 34 19 3.7 E.
- B. ALTERNATE BID No. 2: **Interior Gypsum Board Wall Panels & Finish**
1. Provide wood baseboard and wall panels to the height of 12' AFF
 2. See Specifications Section 09 29 00 2.04 C.
 3. See Drawing Sheet A3.0

PART 2 - PRODUCTS Not used.

PART 3 – EXECUTION Not used.

DIVISION 01 GENERAL REQUIREMENTS

Section 01 11 00 - Description of Work

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The work described in this Project Manual will occur at the southeast corner of the Horlick High School Campus, near the intersection of Mt. Pleasant Street and Yout Street.
- B. An existing 1,300 sf wood frame storage garage shall be razed; existing chain link fencing shall be removed; and portions of existing asphalt pathway shall be removed.
- C. A new Pre-Engineered Metal Building shall be constructed. Service and distribution for new building heating, plumbing, natural gas, electrical, fire detection & alarm; security, voice & data systems shall be installed.
- D. Site work shall include: a new curb cut at Yout Street, and an asphalt pavement access drive; asphalt pavement path restoration & extension; new chain link fencing & gates; and landscaping.
- E. Architectural Work: See ARC Drawings
- F. HVAC Work: See Plan Notes on ARC Drawings
- G. Plumbing Work: See Plan Notes on ARC Drawings
- H. Electrical Work: See Plan Notes on ARC Drawings

1.02 COMPONENTS SUPPLIED BY THE CONTRACTORS:

- A. All labor & materials required for, and incidental to, the completion of all work described and/or shown on the drawings and within this Technical Specification for alterations and improvements to areas shown on the Plans and within this Project Manual Specification, unless specifically indicated as to be provided by others.
- B. Included in the General Contractor's Quotation for the Work shall be payment of all applicable taxes, and fees for Municipal Plan Review and all Building Permits. Plan Review by the State of Wisconsin is not required.

1.03 ALL CONTRACTORS SHALL BE RESPONSIBLE TO:

- A. Keep work areas clean, safe, and free of debris.
- B. Conform to the requirements of the Occupational Safety and Health Act (OSHA) in all work, applications, material handling, and equipment operation, Inc.

- B. Conform to all Federal, State, Local laws & ordinances and City of Racine requirements for fire and safety procedures. In all cases, the Contractors shall employ experienced, qualified craftsmen, and utilize the best accepted standard practices, materials, & methods for this type of work in our locality.
 - C. Meet and maintain RUSD insurance requirements.
 - E. Advise the Owner sufficiently in advance whenever the work is expected to be hazardous to the Owner's employees and/or operations.
 - F. Maintain orderly and safe conditions in all work areas, with daily end-of-the workday clean-up.
 - G. Provide full and complete clean-up after all on-site demolition, construction, painting, finishing, and installation, etc. operations.
 - H. Comply with all standard practice and City requirements to prevent tracking of soils and debris onto City streets, and prevent soils from entering the City storm sewer system at Yout Street.
- 1.04 WORK OR COMPONENTS TO BE SUPPLIED BY THE DISTRICT OR BY OTHER VENDORS; NOT PART OF THIS WORK:
- A. See Section 01 11 16 for Work by Owner.
 - B. See Section 01 64 00 for Owner-supplied products.
 - C. Air Compressor: Provided by RUSD. Installed by General Contractor
 - 1. SPEEDAIRE 60 gallon; 3 HP; 230 V; 15 AMP
 - 2. See Plan Sheet A1.3
 - D. (2) Welding Stations; Provided by RUSD. Installed by General Contractor
 - 1. Equipment not yet selected by RUSD.
 - 2. For Bidding purposes, use: each 120V; 20 Amp
 - 3. See Plan Sheet A1.3
 - E. (2) Ceiling Fans; Provided by RUSD. Installed in future by others; all electrical service components by General Contractor as part of this Work.
 - 1. BIG ASS FANS; each 200-240 VAC 50/60 Hz; Single Phase; 10 Amps
 - 2. See Plan Sheet A1.3
- 1.05 BIDDING PROCEDURES
- A. All General Contractors that will submit quotations for the Work must attend a Mandatory Pre-Bid Meeting with the RUSD Representative and the Architect. The Meeting will be scheduled by the RUSD Representative. Contractors shall tour the project area to describe & understand the Scope of Work, and to note all existing conditions and assess all items, conditions, and locations impacting the Work. Potential Sub-Contractors and Material Suppliers are encouraged, but not required, to attend and participate.

- B. Quotations for the work will be accepted only from General Contractors that have attended the Mandatory Pre-Bid Meeting.
- C. The Owner's Representative shall be designated by the District; and is referred to herein as either "District", or "RUSD", or "Owner".
- D. See RUSD 'Front End' written procedures and requirements within this Project Manual.

1.06 CONFIDENTIAL INFORMATION:

- A. Copy Rights Reserved: Original design work remains the intellectual property of ARC Architectural Group LLC. Designs, details, and structural elements, if any, may not be used for other projects without prior written review and approval of the Architect and RUSD. The designs, information, and data contained herein is proprietary and is disseminated in confidence for use on this project only, and shall not be disclosed, used, duplicated, in whole or in part, for any purposes whatsoever without prior written review and approval of the Architect and RUSD.
- B. Receipt and use of these Construction Documents in bid preparation shall be deemed to be an acceptance of the conditions specified herein.

1.07 GUARANTEES and WARRANTIES:

- A. Upon completion of the project, the Contractor shall deliver to the Owner a one (1) year materials and labor warranty to be effective once complete payment has been received by the Contractor. The work outlined in this specification shall be guaranteed to be free from defects in material and workmanship for a period of one (1) year from the date of project completion and acceptance by the Owner. Necessary instructions and/or services to be performed as a result of defects in material and/or workmanship shall be furnished for a period of one (1) year at no additional cost to the Owner. If the Contractor defaults on this agreement, the Owner may, at its option, have such work done by others and charge all applicable costs to the Contractor.
- B. To the fullest extent permitted by law, the Contractor shall indemnify, save and hold harmless RUSD and ARC Architectural Group LLC, their members, officers, officials, employees, and agents against any and all claims for injuries, deaths, loss, damages, suits, liabilities, judgments, costs, and expenses, including but not limited to fines and penalties related to the Work, and to the handling of hazardous materials as imposed by the State of Wisconsin, or the United States Environmental Protection Agency (EPA), which may arise directly or indirectly from the actions of any Contractor, Sub-Contractor, Material Supplier, or their employees. The Contractor for this Work shall, at his own expense, appear, defend, and pay all costs, charges, attorney's fees, and any other costs arising from the Work contemplated under this contract, or as rendered against the Owner and/or the Architect in any such legal action.

-- END OF SECTION --

Section 01 31 00 Project Management, Coordination, and Administrative Requirements

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Instructions to the General Contractor
- B. Bid submission
- C. Sub-Contractor Quotations
- D. Final Inspection
- E. Preconstruction meeting
- F. Site Mobilization meeting
- G. Progress meetings

1.02 INSTRUCTIONS to the GENERAL CONTRACTOR:

- A. See RUSD bidding procedures set out in this Project Manual. RUSD reserves the right to waive technicalities and to accept any proposal it deems most advantageous to the interests of the District.
- B. Mandatory Pre-Bid Meeting: All potential General Contractors must attend a Pre-Bid Meeting at a time & date to be set by the RUSD, to understand the extent and scope of the work, and to evaluate existing conditions as they pertain to his work in preparation of his bid. At the Pre-bid meeting, all contractors shall sign in on the attendance form provided by the Owner and provide full contact information for the company's primary responsible contact for the project, listing company name & address, area(s) of bidding interest, office phone, fax, cell phone, and & e-mail.
- C. The Contractors shall visit the site to investigate conditions and confirm access for the Contractor's equipment. Additional site investigation and access to Horlick High School to investigate / confirm existing utility systems locations & capacities may be arranged during the Bidding Period by contacting RUSD Facilities Department (262) 631-7014.

1.03 BID SUBMISSION:

- A. The Contractor shall complete all portions of the Certification of Bidders and Bid Request Form. The Owner, through its duly authorized agents, reserves the right to reject any and all bids, waive technicalities, and to select the offer deemed most advantageous to the interests of the Owner. All bidders, by submitting their bids, agree to abide by the rules, regulations, and decisions of the Racine Unified School District impacting this project.
- B. By submitting a quotation for the Work, the General Contractor represents that he and all of his Sub-Contractors and Material Suppliers have read & understood, and agrees to conform to the complete requirements set forth in these Construction Documents (Technical Specifications & Construction Drawings).
- C. The intention of this portion of the Contract Documents is to set forth requirements of performance, types of materials, equipment, structures, components, and standards of construction.

- D. It should be noted that the project, its alternates, and the contract documents may not show all specific field conditions impacting the Work. It shall be the responsibility of the Contractor to explore and ascertain any such conditions. The Contractor may consult or request clarification from the Architect during the bidding period.
- E. Contractors' bids shall include all labor, materials, equipment, and coordination necessary for the completion of the Work, unless otherwise indicated., and as required for complete satisfactory performance of the Work in spite of and omission of specific reference to any minor component part. Any trade materials or methods described in words, which as applied have a well-known trade or technical meaning, shall be held to refer to such recognized and prevailing standards.

1.03 SUB-CONTRACTOR QUOTATIONS:

- A. The General Contractors submitting bids for this Work shall be responsible for assuring that the bid amounts by Sub-Contractors and Material Suppliers utilized as components within the General Contractor's quotation are based upon full knowledge of the existing conditions and full knowledge of the construction plans and specifications. No allowance will be made for claims that quotations were based upon incomplete information regarding project intentions and/or requirements. General Contractors must make sure that the Sub-Contractors base their quotations upon a complete bid set of Construction Drawings and a complete Project Specification Manual.

1.04 FINAL INSPECTION:

- A. When advised by the Contractor that the Work has been completed, the Owner and the Architect shall jointly inspect the Work at their convenience. When the Owner determines that the Work has been completed in accordance with the project Construction Documents, the Owner will accept the Work.
- B. Upon receipt of notice of acceptance, the Contractor shall submit his final invoice.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

- A. Time & date to be set by the Owner; Attendance Required:
 - 1. Racine Unified School District Project Managers
 - 2. ARC Architectural Group
 - 3. Construction General Contractor and major trade Sub-Contractors
 - a. Concrete
 - b. Masonry
 - c. Carpentry / Faming
 - d. Painting
 - e. HVAC
 - f. Plumbing
 - g. Electrical

- B. At the Pre-Construction meeting, all contractors shall sign in on the attendance form provided by RUSD and provide business cards for the company's primary responsible contact for the project, listing all contact information (office phone, fax, and cell phone) for Project Manager and Job Superintendent / Foreman.
 - 1. Note: Material Suppliers should, but are not required to attend.
- C. Agenda:
 - 1. Confirmation of Construction Documents
 - 2. Confirmation of list of Subcontractors, list of Products.
 - 3. Designation of personnel representing the parties to Contract.
 - 4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 5. Preliminary Schedule discussion.
- D. The General Contractor shall be responsible to record minutes and distribute copies within three days after meeting to participants, with one copy each to:
 - 1. RUSD Project Manager
 - 2. ARC Architectural Group
 - 3. Sub-Contractor attendees, participants, and those affected by the decisions made.

3.02 JOB PROGRESS MEETINGS

- A. Prior to the first Job Progress Meeting the General Contractor shall provide to the Architect and RUSD a proposed Job Progress Schedule and a Schedule of Values (on AIA Form G703 – or equal).
- A. The General Contractor shall schedule and administer meetings throughout progress of the Work at maximum bi-weekly intervals.
- B. Attendance Required: Job superintendent, major Sub-Contractors and suppliers, Owner's Representative, Project Architect, and sub-contractors & material suppliers as appropriate to agenda topics for each meeting.
- C. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems, which impede planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Maintenance of progress schedule.
 - 7. Corrective measures to regain projected schedules.
 - 8. Planned progress during succeeding work period.
 - 9. Maintenance of quality and work standards.
 - 10. Effect of proposed changes on progress schedule and coordination.
 - 11. Other business relating to the Work.

- D. The General Contractor shall be responsible to record minutes and distribute copies within three days after meeting to;
1. RUSD Project Manager
 2. Project Architect
 3. Sub-Contractor attendees, participants, Contractors actively working on the jobsite, contractors that will be working on the jobsite prior to the next Job Progress Meeting, and those affected by the decisions made.

-- END OF SECTION --

Section 01 31 13 Project Coordination

1.01 General Instructions:

It shall be the General Contractor's responsibility to notify other Contractors to arrange clearances and access openings for any/all large equipment and materials, and to advise affected Contractors associated with this project of areas requiring coordination before any rough-in is done, so associated work can be installed without interfering with installation of HVAC, Plumbing, and Electrical work.

2.01 Existing Project Conditions:

Information pertaining to existing project conditions, such as locations of architectural and structural building components, mechanical and electrical equipment, piping, ductwork, rough-ins and other miscellaneous construction appears on project drawings. This information is based on available records as well as information collected with reasonable care at the project site. Contractors shall be solely responsible for verifying dimensions and related information at the project site prior to procuring any materials, products or equipment to perform their work.

3.01 The Architect shall not be obligated to comply with any project management software system requirements used by the General Contractor.

-- END OF SECTION --

Section 01 33 00 Submittal Procedures

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 01 42 16 – Definitions

1.02 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review to ARC Architectural Group:
 - 1. Product data.
 - 2. Shop drawings.
 - a. Submissions for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
 - 3. Samples for selection.
 - 4. Samples for verification.
 - 5. Samples will be reviewed for aesthetic, color, or finish selection.
- B. CONTRACTOR - PROPOSED ALTERNATES:
 - 1. If alternate materials or equipment are proposed by the General Contractor for use in lieu of the specific materials and/or equipment specified or listed as acceptable within these Project Technical Specifications, the General Contractor shall provide full product manufacturer's technical documentation for review & evaluation by the Architect or Engineer prior to proceeding with use of the proposed alternate.
 - 2. Costs for Architect and or Engineer review, evaluation, and drawing revisions (if any) resulting from acceptance of GC-proposed alternates shall be invoiced at the Architect's and/or Engineer's standard billing rate to the General Contractor and paid by the contractor within 30 days of invoice date.
 - a. General Contractor's failure to pay such invoiced costs shall result in a deduction from the next request for draw against the Contract Amount in the amount of the invoice(s) and payment to the Architect and/or Engineer.

1.03 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information to ARC Architectural Group. The information shall be kept securely for transfer to RUSD at the appropriate time, or at the completion of the Project.
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Ready mix concrete batch tickets
 - 5. Inspection reports.
 - 6. Manufacturer's instructions.
 - 7. Manufacturer's field reports.
 - 8. Other types included.

1.04 NUMBER OF COPIES OF SUBMITTALS

- A. Documents for Review:
 - 1. Submit four (4) copies; two (2) will be processed & returned; two (2) which ARC Architectural Group will retain.
- B. Documents for Information: Submit two (2) copies.
- C. Samples: Submit four (4); two (2) will be processed & returned; two (2) which ARC Architectural Group will retain.
 - 1. Retained samples will not be returned.

1.05 SUBMITTAL PROCEDURE

- A. It is expected that the General Contractor shall thoroughly review each submittal from the Sub-Contractors and the Material Suppliers for compliance with the Specifications and format requirements prior to forwarding to the Architect for review.
- B. Transmit each submittal with a transmittal letter.
- C. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- D. Identify: Project, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- A. Apply stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- B. Electronic Submittals are acceptable. If the Architect deems additional information or representations are required, the General Contract shall comply and provide additional supplementary printed submittals.
- G. NOTE: The above stated Submittal Procedures shall be the standard for the Project Architect's review of submittals by the contractors.
- H. Schedule submittals to expedite the Project, and coordinate submission of related items. If an immediate review and response is needed to maintain project schedule, so state in the transmittal letter.
- I. For each submittal for review, allow 10 days excluding delivery time to and from.
- J. Identify variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.
- K. Provide space for review stamp by the Project Architect or the Consulting Engineers.
- L. If required, when revised for resubmission, identify all changes made since previous submission.

- M. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

-- END OF SECTION -

Section 01 40 00 Quality Requirements

PART 1 - GENERAL

1.01 Quality Standard Requirements

- A. Code Compliance: All work shall apply with all applicable local, state, and national codes, laws, and ordinances; including requirements for approval, inspection, permits, licenses, and standards.
- B. The materials, fabrication and construction of all components of the work shall meet or exceed standards and references in the Construction Documents. If a conflict appears between referenced standards and or construction document details and/or specifications, the most stringent requirements shall be applied.
- C. The Architect shall be the final authority regarding intent, interpretation, and implementation of the Construction Documents. Unless otherwise specifically stated:
 - 1. Referenced design and construction standards shall be taken from the most current edition and/or revision.
 - 2. The completed work shall comply with standards and practices for premium quality work commonly accepted by Architects, Engineers, and the Trade.
 - 3. Installation of materials, fixtures, systems components, equipment, etc. shall comply with all printed instructions, specifications, and directions of the manufacturer.
- E. Submittals:
 - 1. If listed in the Contract Documents, or if requested by the Architect or Engineer, it shall be the contractor's responsibility to furnish proof that materials and workmanship meets or exceeds the requirements of the documents and standards. The General Contractor shall be responsible to obtain, maintain and furnish copies of original delivery tickets; furnish copies of mix and/or batch tickets; and testing agency reports; and provide same to the Architect upon request.

PART 2 - APPLICABLE STANDARDS

- A. Applicable standards shall be as published by the following agencies or organizations and are hereby included by reference:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
ACI	American Concrete Institute
AI	Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALA	Association of Licensed Architects
ANSI	American National Standards Institute
APA	American Plywood Association
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWI	Architectural Woodwork Institute
AWPI	American Wood Preservers Institute
AWS	American Welding Society
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
GA	Gypsum Association
IBC	International Building Code
NBS	National Bureau of Standards
NBFU	National Bureau of Fire Underwriters
NEC	National Electrical Code
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPA	National Plumbing Code
NRMA	National Ready Mix Concrete Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
SDI	Steel Deck Institute
SDI	Steel Door Institute
SJI	Steel joist Institute
SMACNA	Sheet Metal & Air Conditioning Contractors National Association
UL	Underwriters Laboratories
WECBC	Wisconsin Enrolled Commercial Building Code

PART 3 - NOT USED

-- END OF SECTION --

Section 01 42 16 Definitions

1.01 DEFINITIONS

- A. Reviewed: To give limited, or conditional, or qualified permission to use material, equipment, components or methods which are in strict compliance with the contract requirements. It does not mean unqualified acceptance or waiver of the original requirements.
- B. Equal: To possess the same general performance qualities, capabilities and characteristics, to fulfill the intended utilitarian function without any significant decrease in quality, durability or longevity.
- C. Install: To place, fix in position, secure, anchor, etc., including necessary appurtenances and labor so the equipment or installation will function as specified and intended. This includes all required start-up functions as described herein after in subsequent mechanical sections of this specification or as required by the manufacturer.
- D. Furnish: To purchase or obtain equipment or components and deliver to job site, ready for installation. This includes all required manufacturer's warranties and/or guarantees as hereafter described.
- E. Provide: To furnish and install, as defined above. This includes all required warranties and guarantees.
- F. Or equal: In reference to material and/or equipment specifications, either Project Architect- approved equal, or Project Design Engineer - approved equal.

-- END OF SECTION --

Section 01 64 00 Owner-Furnished Components

1.01 See: DIVISION 02 - EXISTING CONDITIONS Section 02 82 00

A. It is not anticipated that asbestos materials are present in the wood frame storage garage to be razed as part of the Work. If discovered by the contractors, Asbestos Assessment & Remediation will be accomplished for the RUSD under separate contract. Not part of this Work.

B. Equipment - See Section 01 11 00 1.04

(1) Air Compressor

(2) Welding Stations

(2) Ceiling Fans

-- END OF SECTION --

Section 01 77 00 Project Closeout Procedures

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operations and Maintenance Data
- C. Warranties and Bonds

1.02 RELATED SECTIONS

- A. Section 01 33 00 - Submittals Procedures, shop drawings product data, and samples.
- B. Individual Product Selections: Specific requirements for operation and maintenance data.
- C. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to ARC Architectural Group with claim for final Application for Payment.
- B. Operations and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work, to ARC Architectural Group. The Architect shall review draft and return one copy with comments.
 - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection with the Architect's comments.
 - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with the Owner's permission, submit documents within ten days after acceptance.
 - 2. Make other submittals within ten days after Date of substantial Completion, prior to final Application for Payment.
 - 3. Work items for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance listing the date of acceptance as the beginning of the warranty period.

PART 2 -- PRODUCTS Not Used

PART 3 -- EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. The General Contractor shall maintain on-site one set, in good readable condition, of the following record documents (record actual revisions to the work):
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by the Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. For each product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: Accompany as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Panel board Circuit Directories: Provide electrical service characteristics, controls, and communications, typed.
- C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.
- D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- E. Provide servicing and lubrication schedule, and list of lubricants required.
- F. Include manufacturer's printed operation and maintenance instructions.
- G. Include sequence of operation by controls manufacturer.
- H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

3.04 OPERATION AND MAINTENANCE MANUALS

- A. Prepare instructions and data by personnel experienced in maintenance and of described products.
- B. Prepare data in the form of an instructional manual.
- C. Binders: Commercial quality, 8-1/2 x 11 inch three ring binders with D - side durable plastic covers; 1.5" -inch maximum ring size; black in color. When multiple binders are used, correlate data into related consistent groupings.
- E. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

3.05 WARRANTIES AND BONDS

- A. See RUSD requirements in the administrative section of this Project Manual.
- B. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with RUSD's permission, leave date of beginning of time of warranty until the date of Substantial Completion is determined.
- C. Verify that documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Retain warranties and bonds until time specified for submittal.

-- END OF SECTION --

DIVISION 02 - EXISTING CONDITIONS

Section 02 01 00 Maintenance of Existing Conditions

1.01 General Instructions

- A. The Contractors shall take all needed precautions to protect and preserve the existing conditions of the buildings and grounds. Exterior features within the site shall be protected from damage during the course of demolition and construction activities.
- B. The job site must be kept clean, orderly, and safe at all times. Sidewalks, roadways and the Job Site entrance are to be kept clear. Debris shall be removed daily by respective contractors.
- C. The Contractors shall take all needed precautions to protect and preserve the existing conditions of the buildings and grounds. Exterior features within the site shall be protected from damage during the course of demolition and construction activities.
- D. The Owner shall designate one acceptable location for placement of a dumpster for removal of demolition debris. The General Contractor shall be responsible to protect the surface upon which the dumpster is placed from damage, and restore surfaces effected at completion of construction.
- E. Protect existing bituminous asphalt pavement, concrete walkways, and lawn areas during removal of spoils & debris and delivery activities.
- F. Repair any damage sustained during construction operations and return surfaces and features to the conditions existing prior to commencing work under this contract.
- G. The Contractor shall provide and maintain barricades and adequate warning signs to keep personnel away from hazardous areas and shall provide job site conditions as safe as is reasonably possible.
- H. Maintain designated site access for vehicle and pedestrian traffic.
- I. Any damage to existing paved surfaces, utilities, and or fixtures shall be repaired to the satisfaction of RUSD at completion of this Work at no additional cost to RUSD.
- J. Protect all edges and surfaces of doors, frames, and passages from any and all damage and marring due to removal of demolition debris or delivery of construction materials. Any damage to existing paved surfaces, utilities, and or fixtures shall be repaired to the satisfaction of RUSD at completion of this Work at no additional cost to RUSD.

1.02 DUST CONTROL

- A. Use all means necessary to control dust caused by demolition and construction activities, both within the building and at the exterior grounds.
- B. Install a silt fence for containment of wind-blown and water-borne site erosion.

1.03 Products

- A. See silt fence Detail and requirements in Drawings.

1.04 REGULATORY REQUIREMENTS

- A. Conform to all applicable Codes, ordinance, and regulations for proper disposal of debris.

END OF SECTION

Section 02 41 91 Selective Building Demolition

PART 1 - GENERAL

- 1.01 See Site Plan
- 1.02 Remove existing 1,300 sf wood frame Storage Garage, footings & foundation, and adjacent exterior concrete slabs.
- 1.03 Remove existing chain link fencing.
- 1.04 Remove portions of existing asphalt pathway.
- 1.05 Cut & remove portions of existing Curb & Gutter For installation of new Curb Cut on Yout Street.
- 1.06 Scope
 - A. Applicable requirements of Division 01 apply to all work specified in this Section.
 - B. The General, Mechanical, Plumbing, and Electrical Contractors must adhere to the requirements stated in this Section.
 - C. Work included but not limited to:
 - 1. Cutting, fitting, closing and patching, barricades, enclosures, and all work as required to provide openings through all existing floors, walls and roofs.
 - 2. Required by the work for all trades.
 - 3. Required to uncover, inspect, and correct non-conforming work.
 - D. Sealing of openings as required for work to provide finished openings.
 - E. Patching shall include painting or other finish as required to match existing exposed surfaces.
 - F. Related Items Specified Elsewhere:
 - G. Refer to trade Sections for additional requirements as per installation procedures.
- 1.07 APPROVALS AND SUBMITTALS
 - A. Obtain Architect's approval before cutting, drilling, sawing or coring through concrete, masonry or steel or otherwise disturbing any work affecting structural safety to new or existing construction.
 - B. Report any discrepancies to Architect in writing before proceeding with affected work.
 - C. Obtain all necessary permits and approvals before use of torches.
 - D. Obtain consent of other Contractors and Subcontractors before disturbing or interfering with their work.

- E. Inform RUSD Representative 1 work day prior to commencement of cutting operations and obtain Owner's approval. Notices to RUSD employees may be required before proceeding with any cutting which may in any way affect the operation of the Owners existing facilities.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

- 3.01 Perform all cutting, fitting, and patching with qualified personnel using materials, means and methods as described in the applicable trade section of this specification, or in the absence of such determination, in conformance with Architect's direction.
- 3.02 Unless otherwise noted, patching of a surface shall consist of rebuilding the area with the same materials as comprise the surrounding surfaces. Unless otherwise noted or specified, the complete surface such as a wall or ceiling shall then be painted or otherwise refinished to match adjacent surfaces to the nearest corner on either side. Holes in exterior walls for installation or removal of mechanical or electrical work shall be waterproofed. Patching shall include closing of existing holes, openings, etc., caused by removal and/or relocation of existing piping, ducts, conduit, and/or equipment.
- 3.03 Holes shall not exceed the minimum required for duct, pipes, and conduit sizes, including insulation by more than 2". Sleeves required shall be provided by subcontractor who requires the sleeves.
- 3.04 Air hammers or similar methods may not be used except where otherwise approved the RUSD Representative. Openings shall be made by coring, or sawing. In general, holes required in existing concrete shall be coring, sawing or other approved methods. Coring machine for cutting purposes must have warning devices which will indicate when metal or steel of any nature is contacted through use.
- 3.05 Seal all openings at pipes and conduits in exterior walls with non-hardening sealant. Provide proper backing materials. Make wall completely watertight.
- 3.06 All Contractors shall:
 - A. Shall coordinate, perform and time their work so as to avoid or minimize cutting and patching so as not to delay or interfere with the work of other Contractors or building operations and accordingly shall provide information on nature, size and location of all openings, chases, etc., as required and provide all thimbles, sleeves, anchors, inserts, access panels as required for their work.
 - B. Shall check and cross-check Contract Documents pertaining to work of other Contractors to ascertain nature and extent of cutting, fitting and patching required, obtain information on adjacent finishes, and determine coordination required.

- C. Sealing of openings as required will be done by Contractor whose work necessitates cutting and patching. Openings shall be tightly sealed in such a manner to maintain required fire ratings for wall or openings and to meet requirements of the pertinent trade sections.
- 3.07 In existing areas otherwise unaffected by the Work, all Contractors shall:
- A. Contractors may engage General Contractor to perform cutting and patching in these areas at their option.
- 3.08 Completed Work in new and altered areas
- A. Contractor whose ill-timed or defective work necessitates cutting and patching shall bear all resulting costs for correcting work, cutting and patching including removal and restoration of applied material and finishes.
 - B. All contractors shall be responsible for all cutting and patching required by their work in completed areas.
- 3.09 Protect, mask, & contain all dust and debris from demolition activities to prevent entry into adjacent existing building interior rooms, spaces, HVAC ductwork, and other systems.
- 3.10 Control, contain, & collect for disposal all dust & debris from demolition activities on the exterior of the building.
- 3.11 Properly dispose of all demolition debris and excavated materials in full conformance with all applicable municipal ordinances and environmental regulations.

-- END OF SECTION --

DIVISION 03 CONCRETE

Section 03 21 00 Reinforcing Steel

PART 1 - GENERAL

- 1.01 Includes deformed bars for concrete footings, piers, foundation walls, and masonry work; and Welded Wire Mesh for the floor slab.

PART 2 - PRODUCTS

- 2.01 All reinforcing steel shall be new, clean deformed bars of the size specified on the drawings; free from oils,, dirt, and any residue that might prevent proper bonding to the concrete, mortar, or grout.
- 2.02 All reinforcing steel for concrete and masonry work shall conform to the requirements of ACI 117, 301, and 318; Detailing, fabrication, and erection shall conform to the requirements of ACI 315; Manual of Standard Practice (Latest Edition).
- 2.03 6 x 6 - W2.9 x W2.9 Welded Wire Mesh steel reinforcing in the 6" concrete floor slab.

PART 3 - EXECUTION

- 3.01 Install as shown and specified on the drawings.
- 3.02 Overlap splices of reinforcing bars minimum 30 bar diameters.
- 3.03 At corners of Footings and Bond Beams, provide minimum 48" leg around corner, continuous.

-- END OF SECTION --

SECTION 03300 CAST - IN - PLACE CONCRETE

PART 1 - GENERAL

1.01 SECTION INCLUDES, but not limited to: footings, piers, exterior & interior slabs, and walkways.

Provide and set anchors and reinforcement as shown or as required per best trade practices.

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete reinforcement
- D. Joint devices associated with concrete work.
- E. Concrete curing.

1.02 The General Contractor shall review the requirements for these Sections and shall provide all necessary coordination & cooperation for successful execution of all Work under Division 03.

1.03 Scope of Work:

- A. A new stairway and ramp shall be constructed to provide access from the existing door at the shop / classroom area to the new pre-engineered metal building. See Site Plan.
- B. Footings, foundation walls, and piers for the new rigid frame, pre-engineered metal building.
 - 1. Confirm pier & footing sizes, reinforcing steel requirements, and hairpin sizes prior to commencing excavation/construction.
- C. 6" concrete floor slab with 6 x 6 - W2.9 x W2.9 welded wire mesh steel reinforcing.
 - 1. Placement of mesh per best standard trade practice.

1.02

RELATED SECTIONS

Section 07900 -- Joint Sealers.

1.03 REFERENCES

- A. ACI 211.1- Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Re-approved 1997).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 1996.
- C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 1996.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989 (Re-approved 1997).

- E. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International; 1992 (Re-approved 1997).
- F. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.
- G. ASTM A615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- H. ASTM C 33 - Standard Specification for Concrete Aggregates; 1999a.I. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 1999.
- J. ASTM C 150 - Standard Specification for Portland Cement; 1999a.
- K. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- L. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 1998.
- M. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1998a.
- N. ASTM C 330 - Standard Specification for Lightweight Aggregates for Structural Concrete; 1999.
- O. ASTM C494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 1999a.
- P. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete; 1999.
- Q. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink); 1999.
- R. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types); 1999.

PART 2 - PRODUCTS

2.01 FORMWORK

- A. Form Materials: Choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1. Form Facing for Exposed Finish Concrete: Choice of materials that will provide smooth stain-free final appearance.
 - 2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
 - 3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.
 - 4. Remove water which may accumulate in excavations and forms prior to pouring concrete. Do not place concrete in dry forms.

2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
 - 1. Deformed billet-steel bars. _
 - 2. Unfinished
- B. Welded Steel Wire Fabric: ASTM A185, plain type.
 - 1. Coiled Rolls.
 - 2. Wire Gage: 10 x 10.

- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage.
 - 2. Chairs, Bolsters, Bar Supports, and Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C 150-72, Type I - Normal Portland type, air-entrained for exterior work.
- B. Fine and Coarse Aggregates per ASTM C33.
 - 1. Aggregates shall be clean, free of foreign matter, conforming to ASTM C-33 Course aggregates shall meet gradation limits specified in Table II of ASTM C33. Finer aggregates shall be clean sand with hard, durable, uncoated grains, free from impurities, ranging in size from fine to course.
- C. Lightweight Aggregate: ASTM C 330
- D. Fly Ash: ASTM C618, Class C or F.
- E. Calcined Pozzolan: ASTM C 618, Class N.
- F. Silica Fume: ACI211.1
- G. Water: Clean and not detrimental to concrete.

2.04 ADMIXTURES

- A. Air Entrainment Admixture: ASTM C260.
- B. Chemical Admixtures: ASTM C 494/C 494M, Type A - Water Reducing, Type C - Accelerating and Type G - Water Reducing, High Range and Retarding.

2.05 CONCRETE ACCESSORIES

- A. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
- B. Liquid Curing Compound: ASTM C309, Type 1, clear or translucent.

2.06 JOINT DEVICES AND MATERIALS

- A. Joint Filler: Non-extruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751; 1/2" thick and 4 inches deep; tongue and groove profile.

2.07 CONCRETE MIX DESIGN

- > Cement for normal concrete: Type 1 Portland Cement
- > Cement for air entrained concrete: Type 1A Portland cement
- > Aggregates shall meet ASTM standards

Classes of concrete to be used:

Uses	Mix
Footings	4,000 psi @ 28 days; 1.5" stone; 5 bag
All interior concrete	4,500 psi @ 28 days; 1.0" stone; 6 bag
Exterior air entrained	4,000 psi @ 28 days; 1.0" stone; 6 bag

1. The water/cement ratio in all concrete mixes shall be controlled to 0.45/1.00 by weight. Mix and deliver to construction site by means and standards for ready-mix concrete established by ASTM.
2. Concrete delivered in outdoor temperatures lower than 40 degrees Fahrenheit shall arrive on site having a mix temperature of not less than 70 degrees Fahrenheit, nor greater than 90 degrees Fahrenheit.
3. The Concrete Sub-Contractor shall retain sufficient records to permit the Architect to verify compliance with these concrete specifications.
4. Protect concrete from frost or from rapid drying. Keep concrete moist for at least seven days after placing.
5. During the time cement work is placed, protect all existing surfaces and finish work of other trades with non-staining heavy building paper, membrane, or other material required by the situation.
6. Provide expansion joints for walks, curbs, and wherever flat work adjoins vertical surfaces. Unless otherwise shown, expansion joints shall be 1/2" thick bituminous impregnated felt.
7. Provide deformed steel reinforcing bars where indicated on the drawings, or, in addition, where appropriate in the contractor's judgment, per best trade practices.
8. Provide tooled (not saw-cut) control joints.
9. The top of any/all footings shall be a minimum of 4'-0" below finished grade..
10. Proportioning Normal Weight Concrete: Comply with ACI211.1 recommendations.
11. The Concrete mix shall be designed and assembled as a 5-bag mix with 1.0" stone (to #3 sieve size) to obtain a 28-day minimum compressive strength of 4,000, 4,500 PSI, and flexural strengths as specified in accordance with the American Concrete Institute "Design of Concrete Mixes" (ACI 613).

2.08 Water: Clean, clear, potable

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

3.03 INSTALLING REINFORCEMENT

- A. Comply with requirements of ACI301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install with minimum 1.75" concrete cover.
- C. Install wire fabric in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wires.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Install joint devices in accordance with manufacturer's instruction.
- D. Apply sealants in joint devices in accordance with Section 07900.
- E. All concrete placement shall be performed in conformance with best standard trade practices by journeyman level tradesman working under proper supervision to assure long-term satisfactory performance of the completed installation.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI 302.1R;
Steel trowel surfaces that will be left exposed;
 - > Interior slabs - smooth finish
 - > Exterior slabs - light broomed finish
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.
- D. Control joints in concrete slab shall be tooled, not saw cut.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
 - 1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray or saturated burlap.
 - 2. Begin final curing after initial curing but before surface is dry. —
 - a. Curing compound: Apply in two coats at right angles, using application rate recommended by product manufacturer.
- D. Immediately report and replace any & all concrete work that is vandalized, to meet the approval of the Architect, at no additional cost to the Owner.
- E. The Contractor will assume full responsibility for the safekeeping of all materials and equipment for all unfinished and finished work until final acceptance by the Owner, and if any of it be lost, damaged, or destroyed from any cause, the Contractor will replace it at his own expense

END OF SECTION

DIVISION 04 - MASONRY

Section 04 05 16 Masonry Mortars & Grouting

PART 1 - GENERAL

1.01 See Section 04 21 13

PART 2 - PRODUCTS

2.01 Mortar for Brick Masonry: ASTM C 270, using the Proportion Specification.

- A. Exterior, load bearing masonry: Type S.
- B. Exterior, non-load bearing masonry: Type S.

PART 3 - EXECUTION

- A. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less: coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- B. Mixing: Use mechanical batch mixer and comply with referenced standards.
- C. Install per best standard trade practices

END OF SECTION

Section 04 21 13 Brick Masonry

PART 1 - GENERAL

1.01 Description / Extent

- A. The Façade Elevations shown on Plan Sheets A2.0 and A2.1 show the extent of Brick Masonry veneer.
- B. The brick veneer shall be installed over DensGlass exterior sheathing on structural steel studs. See Details.

1.02 Submittal:

- A. Provide six (6) full-size sample bricks
- B. Submit full color sample(s) of each brick type specified or selected from manufacturer's color palette. Submit brick product literature, test reports, and product certifications.
 - 1. Provide six (6) bricks for approval by Architect to confirm type, color, & variations specified.
 - 2. Provide suppliers full line of mortar color samples for selection and approval by Architect.

1.03 Delivery, Storage and Handling:

- A. Brick Masonry shall be delivered to the job site on pallets and stacked only one pallet high on level ground. Delivered pallets shall be protected from inclement weather with a waterproof covering. Units shall be handled carefully to avoid breakage and damage.

1.04 Extreme Weather Construction:

- A. Temperatures between 40 and 90°F (4.4 and 32.2°C) are considered "normal" temperatures for masonry construction and therefore do not require special procedures or protection protocols. When ambient temperatures fall below 40°F (4.4°C), the Specification for Masonry Structures requires consideration of special construction procedures. Similarly, when the minimum daily temperature for grouted masonry or the mean temperature for ungrouted masonry falls below 40°F during the first 48 or 24 hours after construction respectively, special protection considerations are required.

1.05 Rain and Masonry Construction:

- A. The presence of rain, or the likelihood of rain, should receive special consideration during masonry construction. Unless protected, masonry construction should not continue during heavy rains, as partially set or plastic mortar is susceptible to washout, which could result in reduced strength or staining of the wall. However, after approximately 8 to 24 hours of curing (depending upon environmental conditions), mortar washout is no longer of concern. When rain is likely, all construction materials should be covered. Newly constructed masonry should be protected from rain by draping a weather-resistant covering over the assemblage. The cover should be secured in place and extend over all mortar that is susceptible to washout.

PART 2 - PRODUCTS

2.01 Brick Manufacturer and Item:

- A. The Architect has selected color matched brick samples provided by County Materials Corporation
- B. Brick masonry veneer below the precast belt course shall be:
 - 1. Manufacturer: The Belden Brick Company
 - 2. Brick Series: Modular Sea Gray Velour A 15-50
 - 3. Source: Sugarcreek Plant 6
- C. Brick masonry veneer below the precast belt course shall be:
 - 1. Manufacturer: Cloud Ceramics
 - 2. Size: Modular
 - 3. Texture: WIRETEX
 - 4. Item Mixture by proportion to replicate existing brick masonry:
 - 50% DRIFTWOOD GREY
 - 30% LT. AUTUMN
 - 20% CHEROKEE BLEND
- D. Belt course Accent Band: Ultra Burnished Masonry Units
 - 1. Manufacturer: County Materials
 - 2. Item, #: 6" Horizon Smoothface Concrete Sill #066017

2.02 Referenced Standards:

- A. Units shall meet or exceed the requirements of:
 - 1. ASTM C 55 Concrete Brick

2.03 Characteristics:

- A. Compressive strengths: Average net area: 4000 psi
- B. Absorption: Maximum water absorption (24 hr. submersion): 6.8%

PART 3 - EXECUTION

3.01 Design Practices and Installation:

- A. Careful consideration should be given to the placement of control joints and the use of horizontal joint reinforcement, brick wall ties, weep holes and water resistant sealants. It is expected that all units will be laid using the best brick masonry construction practices. For maximum construction efficiency and economy.

3.02 Control Joints:

- A. Control joints are one method used to relieve horizontal tensile stresses due to shrinkage of masonry units, mortar, and when used, grout. They are essentially vertical separations built into the wall at locations where stress concentrations may occur. These joints reduce restraint and permit longitudinal movement. Brick requires vertical control joints to accommodate panel contraction.
- B. Control Joint Placement: Control joints should be located where volume changes in the masonry due to drying shrinkage, carbonation, or temperature changes are likely to create tension in the masonry that will exceed its capacity. The following are suggested methods to provide guidance in locating control joints.
 - 1. At changes in wall height,
 - 2. At changes in wall thickness, such as at pipe and duct chases and pilasters,
 - 3. At (above) movement joints in foundations and floors,
 - 4. At (below) movement joints in roofs and floors that bear on the wall,
 - 5. Near one or both sides of door and window openings, (generally, a control joint is placed at one side of an opening less than 6 ft wide and at both jambs of openings over 6 ft wide). Control joints can be away from the opening if adequate tensile reinforcement is placed above, below and beside wall openings. Adjacent to corners of walls or intersections within a distance equal to half the control joint spacing requirement for that wall.
 - 6. For walls without openings or other points of stress concentration, control joints are used to effectively divide a wall into a series of isolated panels.
 - 7. Recommended Control Joint Spacing for Above Grade Exposed Concrete Masonry Walls*
DISTANCE BETWEEN JOINTS SHOULD NOT EXCEED THE LESSER OF: Length to height ratio in feet: 1.5 to 1.0
 - 8. Control joint spacing should be adjusted up or down where local experience justifies but no farther than 25 feet.

3.03 Horizontal Joint Reinforcement: Continuous, 4" joint reinforcement is required 16" on center vertically in all veneer applications and in the exterior wythe of composite wall construction. Nonstructural, horizontal, joint reinforcement, should not be continuous through a control joint, since this will restrict the horizontal movement. However, structural reinforcement, such as bond beam reinforcement at floor and roof diaphragms that resists diaphragm chord tension, must be continuous through the control joint, but provisions should be allowed for longitudinal movement.

3.04 Accessories:

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Acceptable manufacturers:
 - a. Dur-O-Wal: www.dur-o-wal.com
 - b. Heckmann Building products, Inc.: www.heckmannbuildingprods.com
 - c. Hohmann & Barnard, Inc.: www.h-b.com
- B. Weep/Cavity Vents: Polyethylene tubing

3.05 Weep Holes:

- A. To properly drain water collected on any flashing or horizontal surface, weep holes must be provided immediately above the flashing or horizontal surface at all locations, following standard industry practices. Weep holes should be at least 1/4 inch in diameter, and should be spaced no further apart than 32 inch. o.c. horizontally. When using wick type material in the weep hole, the spacing should be reduced to a maximum of 16 inch o.c.

3.06 Veneer Anchors:

- A. Use an anchor that allows for vertical & horizontal movement. Examples:
 - 1. Hohman Barnard
 - 2. Type III veneer anchor w/triangular tie manufactured by Wire Bond.
- B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153A, 153M, Class B-2.

3.07 Flashing:

- A. Install flashing is to intercept the flow of moisture behind masonry and direct it to the exterior of the structure. Flashing is recommended for all locations where moisture may potentially penetrate into a wall and where the free drainage of water is blocked.
 - 1. Critical locations
 - a. Top of walls
 - b. Above openings
 - c. Beneath sills
 - d. Above shelf angles
 - e. At the base of walls.
 - 2. Flashing may also be utilized in walls at ground level to serve as a moisture retarder to reduce the amount of water wicked up into the masonry above grade.
 - 3. Copper: ASTM B370, 060 soft annealed; 20 oz/sq ft thick; natural finish.
 - 4. Stainless Steel: ASTM A 666, Type 304, soft temper; 26 gauge (0.45 mm) thick;
 - 5. Lap Sealant: Butyl type.

3.07 Project/Site Conditions:

- A. During construction of exposed brick masonry, minimize mortar and grout smears on the face of the units. Mortar droppings which adhere to the exposed face of the units can be removed with a trowel or chisel after being allowed to harden. Remove any remaining mortar with a stiff fiber brush. The base of the wall should be protected from mud splashing and mortar droppings by spreading plastic sheets four feet on the ground and three feet up the wall. Covering the tops of unfinished walls at the end of the workday prevents rain and outside elements from entering the wall and thus reduces the chance of efflorescence forming on the wall. Covers should be draped at least two feet down each side of the wall and a method provided to hold them in place.

3.08 Mortar and Mortar Joints:

- A. Use a complementary color to match the existing brick.
 - 1. Provide color samples for selection by Architect; see Submittal requirements.
 - 2. Concave or V-shaped tooling of joints, when the mortar is thumbprint hard, improves moisture resistance by compacting the mortar against the masonry unit to seal the joint.

- 3. Head and bed joints should be the full thickness of the face shells for optimum water tightness.
- 3.09 Cleaning:
 - A. Clean using traditional masonry cleaning methods, such as mild masonry detergents/cleaners and power-washing systems properly applied. Strong acids, acid washes or chemicals with a strong acid reaction should not be used, since they may reduce the water repelling properties of treated masonry and etch the surface, distorting the color. Keep the masonry wall clean as the construction progresses and use a brush and water after the mortar has hardened.

END OF SECTION

DIVISION 05 - METALS

SECTION 05 50 00 METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Square Structural Steel Tube Columns
- B. Steel Pipe Guardrail

1.02 RELATED SECTIONS

- A. Section 03300 — Cast-In-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04810 - Unit Masonry Assemblies: Placement of metal fabrications in masonry.
- C. Section 09900 - Paints and Coatings: Paint finish.

1.03 REFERENCES

- A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware; 1998.
- C. ASTM A 283 A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 1998.
- D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 kips Minimum Tensile Strength; 1997.
- E. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1997.
- F. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).
- G. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1995 (Part of Steel Structures Painting Manual, Vol. Two).

PART 2 - PRODUCTS

2.01 MATERIALS - STEEL

- A. Square Structural tubing: ASTM A 36/A 36M.
- B. Top Plates: ASTM A 283.
- C. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A325M) galvanized to ASTM A 153/A, 153M for galvanized components.

- D. Steel Pipe Guardrail at Stair; See Plan Sheet A4.3
 - 1. 1-1/2" or 2" diameter standard steel pipe.
 - 2. Top rail at 36" above the walking surface.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, Type 1 - Red Oxide.

2.02 FABRICATION

- A. Shop weld top plates to standard steel pipe columns (SSP).
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth and adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Guardrails
 - 1. Comply with the requirements of the Wisconsin Enrolled Commercial Building Code and the Americans with Disabilities Act.

2.04 FINISHES - STEEL

- A. Prime & paint all steel items.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing
- D. Prime Painting: One coat.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

END OF SECTION

DIVISION 06 - WOOD, PLASTICS, & COMPOSITES

Section 06 10 00 ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Construction of structural steel stud framing, exterior sheathing, and interior gypsum board wall panels.
- B. Construction of Roof Canopy at stairs between existing and new buildings.
- C. Construction of other items as determined by the General Contractor.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Receive and cover materials protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 - PRODUCTS

- 2.01 Lumber used for the Roof Canopy shall be Pressure Preservative Treated, Douglas Fir / Larch; selected for straightness and flatness, & lack of twist.
- 2.02 Double 2x6 wood sill plates at structural metal studs shall be pressure-preservative-treated lumber.
- 2.03 Steel Studs shall be 12 ga. 5-1/2" x 2" Flange Punched Structural Studs, spaced at Maximum 24" o.c.
 - A. Clark Dietrich Product no. 550S200-97, or Architect-Approved equal.
- 2.04 Exterior wall sheathing at structural metal studs shall be 5/8" DenseGlass Fireguard Sheathing, as manufactured by Georgia-Pacific.
- 2.05 Gypsum Board interior
 - A. Source
 - 1. No gypsum board products manufactured in Asia may be used.
 - 2. Shop Drawing Submittal must state manufacture and source board product.
 - B. BASE BID: No interior gypsum board wall panels.

- C. ALTERNATE BID No. 2: Provide gypsum board wall panels to the height of 12'- 0" above the floor slab, installed above a 1x4 treated lumber baseboard.
1. Gypsum board panels shall be Georgia-Pacific ToughRock Fireguard X Abuse-Resistant Gypsum Board.
 2. Tape joints and Finish with USG Sheetrock Brand Tuff-Hide Primer-Surfacers.

PART 3 - EXECUTION

3.01 FRAMING INSTALLATION

- A. Set blocking furring members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance.
- B. Install furring and gypsum panels full length without splices.
- C. Comply with product manufacturer's printed installation recommendations and best standard trade practices.

3.02 INSTALLATION TOLERANCES

- A. Framing Members: 1/16 inch from true position, maximum.
- B. Variation from Plane: 1/8 inch in 8 feet maximum.
- C. Install gypsum board panels per manufacture's recommendations.
 1. Properly screw-attach at perimeter of sheets every 6". Properly screw-attach to studs within field every 12".

-- END OF SECTION --

DIVISION 07 - THERMAL & MOISTURE PROTECTION

Section 07 21 16 THERMAL BATT INSULATION

PART 1 - GENERAL

1.01 SECTION INCLUDES: Blanket Insulation within steel stud wall cavities

A. RELATED SECTIONS

1. Section 05 12 00 Structural Steel Framing
2. Section 06 16 43 Gypsum Board Wall Construction

1.02 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

National Fire Protection Association (NFPA) Life Safety Code

B. SUBMITTALS Submit under provisions of Section 01 33 00:

1. Product Data: Manufacturer's data sheets on each product to be used, including:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
 - d. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.03. QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of ten years' experience manufacturing products in this section shall provide all products listed.

B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years' experience successfully installing insulation on projects of similar type and scope as specified in this section.

D. DELIVERY, STORAGE, AND HANDLING

1. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
2. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.
3. Handling: Handle materials to avoid damage.
4. SEQUENCING: Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
5. PROJECT CONDITIONS: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

Part 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, 750 E. Swedesford Rd. P. O. Box 860 ; Valley Forge, PA 19482-0860;
- B. Substitutions: Substitutions will be considered of insulation products having equal material and performance characteristics by other manufacturers. Provide Architect with full product literature and product cut sheets with Shop Drawing Submittal for review and Approval by the Architect prior to placing order.
- C. R-values:
 - 1. 5-1/2" Structural Steel Stud Walls:
 - a. Type: Batt
 - b. Thickness: 5.5"
 - c. R-19 minimum
 - d. Vapor Retarder: Vinyl facing.
 - 2. Ceiling
 - a. Type: Batt
 - b. Thickness: 10"
 - c. R-32 minimum
 - d. Vapor Retarder: Vinyl facing.

Part 3 - EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until sheathing & substrates have been properly prepared. Verify that all interior construction has been completed to the point where the insulation may correctly be installed. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested.
- B. If substrate preparation is the responsibility of another installer, notify Architect of any unsatisfactory preparation needing correction before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Install in spaces without gaps or voids. Do not compress insulation. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation. Install insulation with vapor barrier installed facing the warm side. Seal or tape joints as required.

3.04 PROTECTION

- A. Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

-- END OF SECTION --

DIVISION 08 - OPENINGS

Section 08 11 00 FLUSH STEEL DOORS

PART 1 - GENERAL

- 1.01 Submit shop drawings for review and approval by the Architect prior to placing order / fabrication.
- A. Provide clear fabrication drawings and information regarding all materials, assembly, and anchorage.
- B. Provide Architect with two complete copies of manufacturer's door warranty information.
- C. Provide Owner with manufacturer's written twenty (20) year warranty covering defects in materials and workmanship.

PART 2 - PRODUCTS

- 2.01 Flush Steel Doors Frames shall be as manufactured by either Steel Craft, Cincinnati, Ohio; or equal by CURRIES, Mason City, Iowa.
- 2.02 Doors shall have a factory applied rust inhibitive primer.
- 2.03 New Doors & Frames:
 - A. New passage Doors & Frames are required for (2) openings, each 3'-6" x 7'-0" x 1-3/4"
 - B. One (1) Overhead door is required; 14' x 14'
 - C. Passage Doors will be furnished as part of the pre-engineered metal building package.
 - D. Doors shall be pre-finished, Color to match exterior wall panel color.
- 2.04 2.09 Related Sections:
 - A. Section 08 11 00 Door Hardware

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Locate & install so that door may freely open a minimum of 110 degrees, or as appropriate by the specific installation condition.
- B. Fit and install and anchor frame, door, & panels plumb; assuring smooth operation, In accordance with approved shop drawings and manufacturer's installation recommendations.
- C. Follow all Frame manufacturers anchoring recommendations, and best trade practices for maximum Duty / High Traffic Areas when installing Frames for Doors 02 and 03.
- C. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to Architect's satisfaction.

-- END OF SECTION --

Section 08 36 16 VERHEAD SECTIONAL DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Commercial sectional doors.

1.2 RELATED SECTIONS

- A. Section 08710 - Door Hardware: Hardware, locks, access panels.
- B. Section 09900 - Painting: Field painting.
- C. Section 16050 - Basic Electrical Materials and Methods: Electrical connections and service for powered door operators.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM) A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. American Society for Testing and Materials (ASTM) C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- C. American Society for Testing and Materials (ASTM) E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings:
 - 1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
 - 2. Regulatory Requirements and Approvals: Provide shop drawings in compliance with local Authority having Jurisdiction (AHJ).
- D. Certifications:
 - 1. Submit manufacturer's certificate that products meet or exceed specified requirements.
 - 2. Submit installer qualifications.
- E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- F. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity, and trained and authorized by the door manufacturer to perform the work of this section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Provide manufacturer's standard warranty against defects in material and workmanship, as further described in Part 2 of this Section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Raynor, which is located at: 1101 East River Rd. P. O. Box 448 ; Dixon, IL 61021-0448; Toll Free Tel: 800-4-RAYNOR; Tel: 815-288-1431; Fax: 888-598-4790; Email: [request info \(thegarage@raynor.com\)](mailto:request info (thegarage@raynor.com)); Web: www.raynor.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 0133 00 1.02. B.

2.2 SECTIONAL THERMAL POLYSTYRENE INSULATION SANDWICH DOOR

- A. TC Series as manufactured by Raynor Garage Doors:
- B.
 - 1. Doors:
 - a. Operation:
 - 1) Provide doors designed for electric motor operation.
 - b. Jamb Construction:
 - 1) Steel jambs with self-tapping fasteners.
 - c. Structural Performance Requirements:
 - 1) Wind Loads: Gusts to 90 mph
 - d. International Energy Conservation Code (IECC) Requirements
 - 1) Air Infiltration – Maximum air leakage of 0.4 cfm/ft² is required. Testing shall be in accordance with DASMA 105 test procedure.
 - 2) TC320 provides an air leakage rate rating of 0.19 cfm/ft² with optional IECC Compliance Package.
 - 3) TC320 provides an installed U-factor of 0.19.
 - 2. Sections:
 - a. TC320:
 - 1) Sections shall be mechanically interlocked and pressure bonded to a 2-7/8 inches (73 mm) thick extruded polystyrene core. Hinge reinforcement plates shall be 16-gauge edge plates and 16-gauge center plates, located within section interior at every hinge location. End stiles to be 14-gauge galvanized steel.

- 2) Material: Steel sandwich construction, 3 inches (76mm) thick, roll formed from commercial quality, hot-dipped galvanized (G90 exterior) steel complying with ASTM A 653. Exterior skin shall be constructed of 20-gauge steel smooth texture.
 - a) Interior skin to be constructed of 20-gauge steel smooth texture.
 - 3) Finish: Exterior skin to have two coats of paint, one primer coat and one finish coat.
 - a) Color: White polyester paint.
 - 4) Insulation: Extruded polystyrene with R-value of 17.05.
 - 5) Seals: Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.
 - 6) Provide blade seal on top section to prevent airflow above header.
- b. Trussing: Doors designed to withstand specified wind load. Deflection of door in horizontal position to be maximum of 1/120th of door width.
3. Windows: (3) - Locations to comply with door elevation drawings.
 - a. 24 inches by 12 inches (610 mm by 305 mm) window in a rectangular two-piece black frame.
 4. Glazing: Windows to be provided with insulated glazing units as follows:
 - a. Glass consisting of two panes of 1/8 inch (3.2 mm) thick DSB glass.
 5. Track:
 - a. Material: Hot-dipped galvanized steel (ASTM A 653), fully adjustable for adequate sealing of door to jamb or weatherseal.
 - b. Configuration Type:
 - 1) Configuration Type: Normal Headroom.- VERIFY
 - c. Track Size:
 - 1) Size: 3 inches (76 mm).
 - d. Mounting:
 - 1) Floor-to-Shaft Angle-Mount consisting of continuous angle extending from the floor, past header, completely up to door shaft for use with steel, wood, or masonry jambs. Continuous angle size not less than 2-5/16 inches by 4 inches by 3/32 inch (59 by 102 by 2.5 mm) on 2-inch track and 3-1/2 inches by 5 inches by 1/8 inches (89 by 127 by 3.2 mm) on 3-inch track.
 - e. Finish: White Powdercoat.
 6. Counterbalance:
 - a. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
 - 1) Spring Cycle Requirements: High cycle: 15,000 cycles.
 7. Hardware:
 - a. Hinges and Brackets: Fabricated from galvanized steel.
 - b. Track Rollers: 3 inches (76.2 mm) diameter consistent with track size, with hardened steel ball bearings.
 - c. Perimeter Seal: Provide complete weather stripping system to reduce air infiltration. Weather stripping shall be replaceable.
 - 1) For angle mounted doors provide angle clip-on seal.
 - d. Furnish door system with locks: Interior lock with dead bolt provided with hole to receive padlock provided by Owner.

8. TC Limited Warranty: Raynor warrants the door sections against defects in material and workmanship, and deterioration due to rust-through for ten years from date of delivery to the original purchaser. Raynor also warrants the door sections against delamination of the insulation from the steel skins for ten years from date of delivery to the original purchaser. Window components are warranted against defects in material and workmanship for one year from date of delivery to the original purchaser. Raynor warrants all hardware and spring components against defects in material and workmanship for one year (or cycle life of the springs) from date of delivery to the original purchaser. Additional Limited Warranty requirements in accordance with manufacturer's full standard limited warranty documentation.
- C. ControlHoist as manufactured by Raynor Garage Doors:
1. Model:
 - a. Raynor ControlHoist Optima:
 - 1) Type: Jackshaft with manual chain hoist.
 - 2) Type: Trolley.
 - 3) Motor Horsepower Rating: Continuous 1-1/2 HP.
 - 4) Electrical Requirements: 115-volt single phase.
 - 5) Control Wiring: Solid state circuitry with provisions for connection of safety edge to reverse, external radio control hook-up and maximum run timer. Provisions for timers to close, monitored reversing devices, mid stop and lock bar sensor capability.
 - a) Provide three button momentary contact "open-stop", constant pressure on close (can be changed to momentary to close).
 - 6) Duty Cycle: 10 cycles/hour.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. Verify that site conditions are acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to shop drawings, manufacturer's instructions.
- B. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 PROTECTION

- A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.
- B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.
- C. Lubricate bearings and sliding parts, assure weather tight fit around door perimeter and adjust doors for proper operation, balance, clearance and similar requirements. Protect installed products until completion of project.
- D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Section 08 71 00 DOOR HARDWARE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hardware for new steel flush doors.

1.02 REFERENCES

- A. ANSI/CC AI 17.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.
- B. DHI (LOGS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 1990.

1.03 SUBMITTALS for review and approval by the Architect, prior to placing an order for the wood doors, submit:

- A. Manufacturer's product data sheets and catalog cut sheets.
- B. Shop Drawings, indicate hardware item, location, mounting height on the door, and written job-specific manufacturers' warranties.
- C. See Section 01 33 00 - Submittal Procedures.
- D. Warranty: Submit manufacturer's warranty and ensure that all necessary forms have been completed and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- B. No substitutions for Schlage locksets.

1.06 COORDINATION

- A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.
- B. Furnish templates for door and frame preparation.

PART 2 - PRODUCTS

2.01 DOOR HARDWARE SETS

Set No. 1

A. Hinges furnished with pre-engineered metal building package

B. Lockset

Manufacturer:	Schlage
Series:	Series 4000
Type:	Bored Entrance / Office Lock
Standard:	ANSI A156.2, 1996 F82
Grade:	AL50PD / Grade 2
Style:	SATURN
Finish:	Satin Chrome US-26D

C. Closer

Manufacturer:	Norton
Series:	Series 9500
Type:	Cast Iron Door Closer
Quantity:	(2) required
Standard:	ANSI / BHMA A156.4; UL10C
Finish:	Satin Chrome 626

2.02 Locksets Keying: locksets shall be supplied & installed with standard Schlage keying; provide (2) keys per door to Owner. Owner shall re-key.

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

- A. Provide products that comply with the following:
1. Applicable provisions of Federal, State, and local codes.
 2. ANSI/ICC A17.1, American National Standard for Accessible and Usable Buildings and Facilities.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Mounting heights for hardware from finished floor to centerline of hardware item: As shown on drawings, and shall comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames.

3.03 ADJUSTING

- A. Adjust hardware for smooth operation.

3.04 PROTECTION OF FINISHED WORK

- A. Protect finished Work. Do not permit adjacent work to damage hardware or finish.

-- END OF SECTION --

Section 08 60 00 Skylights

PART 1 - GENERAL

1.01 See Section 00 24 13. Alternate Bid No. 1

PART 2 - PRODUCTS

2.10 NORCO Curb-mounted Prismatic Skylights (6) required

A. Provided as part of the Pre-Engineered Metal Building package.

PART 3 - EXECUTION Not used.

DIVISION 09 - FINISHES

SECTION 09 29 00 Gypsum Board Assemblies

PART 1 - GENERAL

- A. Provide gypsum wallboard including all accessories for new construction.
- C. Work shall be coordinated with the work of other trades.

PART 2 – PRODUCTS

2.01 Exterior wall sheathing at structural metal studs shall be 5/8" DenseGlass Fireguard Sheathing, as manufactured by Georgia-Pacific.

2.04 Gypsum Board interior

- A. Source
 - 1. No gypsum board products manufactured in Asia may be used.
 - 2. Shop Drawing Submittal must state manufacture and source board product.
- B. BASE BID: No interior gypsum board wall panels.
- C. ALTERNATE BID No. 2: Provide gypsum board wall panels to the height of 12'- 0" above the floor slab, installed above a 1x4 treated lumber baseboard.
 - 1. Gypsum board panels shall be Georgia-Pacific ToughRock Fireguard X Abuse-Resistant Gypsum Board.
 - 2. Tape joints and Finish with USG Sheetrock Brand Tuff-Hide Primer-Surfacer
 - 3. Conform to ASTM C36 standards. Thickness: 5/8".
 - 4. Screws: USG drywall screws, type S or Type W, as appropriate for the application.
 - 5. Joint Treatment: USG Durabond or Perf-A Tape joint system.

PART 3 - EXECUTION

- A. Screws shall be power- driven with an electric screwdriver. Screw heads shall be set slightly below the surface of the gypsum wallboard.
- B. Do not place screws closer than ½ inch from the edges and the ends of the wallboard.
- C. Screw fasteners @ 12" o.c. in field of board and maximum 8" o.c. along abutting edges or ends.

-- END OF SECTION --

Section 09 91 13 EXTERIOR PAINTING

PART 1 - GENERAL

- 1.01 Steel columns and guardrail shall be shop primed prior to delivery to the site
- 1.02 After installation apply finish paint coats.
- 1.03 The Painting/Finishing Contractor shall be responsible to comply with the specified system materials and apply in conformance with the paint manufacturer's printed instructions per applicable methods.
- 1.04 Provide pairs of finished painted material samples for review and approval by the Architect.
- 1.05 Submit product selection, color sample for approval, and manufacturer's technical information and application instructions for each product proposed for use.
- 1.06 Submit product safety outline describing how adequate ventilation will be provided for flammable or noxious products.
- 1.07 Deliver products to the job site in the original unopened containers bearing the manufacturer's name and label with trade name and instructions.
- 1.08 Store products and materials not in use in tightly covered containers in a well area ventilated at a minimum ambient temperature of 45 degrees.
- 1.09 Keep storage area clean and orderly. Remove used rags containing oils, solvents, or other flammable residues at the end of each day's work.
- 1.10 Upon completion of this work any paint purchased for the project and remaining unused may, at the Owner's option, be retained by the Owner. Seal as appropriate for storage, clearly mark contents on container, and store in room as directed by the Owner's Representative.
- 1.11 SECTION INCLUDES
 - A. Surface preparation.
 - 1. Field application of paints and other coatings.
 - 2. See Finish Schedule - Surfaces to be Finished, at end of Section.
- 1.12 SUBMITTALS
 - A. See Section 01 31 00 - Administrative Requirements, for submittal procedures.
 - B. Product Data: Provide data on all finishing products.
 - C. Samples: Submit two paper chip samples, in size illustrating range of colors and textures available for each surface finishing product scheduled.
 - D. Manufacturer's Instructions: Indicate special surface preparation procedures.

- E. Maintenance Data: Submit data on cleaning, touch up, and repair of painted and coated surfaces.

1.13 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.14 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.

1.15 EXTRA MATERIALS

- A. Supply 1 gallon of each color; store where directed.
- B. Label each container with color in addition to the manufacturer's label.

PART 2 - PRODUCTS

- 2.01 After installation, all exposed steel surfaces shall be painted as part of this work with:
 - 1. One coat Benjamin Moore Universal Primer PO7-20
 - 2. Two coats Benjamin Moore MooreGuard Satin Finish W 103
 - 3. No substitutions.
 - 4. Color to be specified by Architect with Shop Drawing Approval

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. The back side of the Wood Base is to be primed prior to installation.

3.02 PREPARATION

- A. Surfaces: Correct defects and clean surfaces, which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- B. Marks: Seal with shellac those, which may bleed through surface finishes.
- C. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
 - 3. Stainless steel items.

-- END OF SECTION --

Section 09 91 23 INTERIOR PAINTING

PART 1 - GENERAL

1.01 SCOPE Interior Painting is limited to:

- A. Painting the 1 X 4 Wood Base at the interior gypsum board panels as part of ALTERNATE BID No. 2.
- B. Finish system application to gypsum board wall panels as part of ALTERNATE BID No. 2.

1.02 GENERAL

- A. Paint Systems for Gypsum Board Walls is specified in Section 09 29 00 Gypsum Board Assemblies
- B. The Painting/Finishing Contractor shall be responsible to comply with the specified system materials and apply in conformance with the paint manufacturer's printed instructions per applicable methods.
- C. Provide pairs of finished painted material samples for review and approval by the Architect.
- D. Submit product selection, color sample for approval, and manufacturer's technical information and application instructions for each product proposed for use.
- E. Submit product safety outline describing how adequate ventilation will be provided for flammable or noxious products.
- F. Deliver products to the job site in the original unopened containers bearing the manufacturer's name and label with trade name and instructions.
- G. Store products and materials not in use in tightly covered containers in a well area ventilated at a minimum ambient temperature of 45 degrees.
- H. Keep storage area clean and orderly. Remove used rags containing oils, solvents, or other flammable residues at the end of each day's work.
- I. Upon completion of this work any paint purchased for the project and remaining unused may, at the Owner's option, be retained by the Owner. Seal as appropriate for storage, clearly mark contents on container, and store in room as directed by the Owner's Representative.

1.03 SECTION INCLUDES

- A. Surface preparation.
 - 1. Field application of paints and other coatings.
 - 2. See Finish Schedule - Surfaces to be Finished, at end of Section.

1.04 SUBMITTALS

- A. See Section 01 31 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on all finishing products.
- C. Samples: Submit two paper chip samples, in size illustrating range of colors and textures available for each surface finishing product scheduled.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data on cleaning, touch up, and repair of painted and coated surfaces.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft. candles measured mid-height at substrate surface.

1.07 EXTRA MATERIALS

- A. Supply 1 gallon of each color; store where directed.
- B. Label each container with color in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 Paint Finish Systems - See Plan Sheet A6

- A. **P-1** Paint System for interior gypsum board panels: After joints are taped, Finish with USG Sheetrock Brand Tuff-Hide Primer-Surfacer.
- B. **P-2** Paint system for 1x4 wood base
 - 1. Primer: Benjamin Moore Primer No. 024
Multi-Purpose Oil Based Primer
No Substitutions. Apply per manufacturer's printed instructions.
 - 2. Paint: Benjamin Moore Low Lustre No. 542 'ben' Exterior Paint
Color: Amber Slate CW-683
No Substitutions. Apply per manufacturer's printed instructions.
 - 3. No substitutions.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. The back side of the Wood Base is to be primed prior to installation.

3.02 PREPARATION

- A. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces, which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- C. Marks: Seal with shellac those, which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 SCHEDULE - SURFACES TO BE FINISHED

- A. Do Not Paint or Finish the Following Items:
 - 1. Items fully factory-finished unless specifically noted.
 - 2. Fire rating labels, equipment serial number and capacity labels.
 - 3. Stainless steel items.

-- END OF SECTION --

DIVISION 10 SPECIALTIES

Section 10 44 16 Fire Extinguishers

PART 1 GENERAL

- 1.01 Provide two (2) Fire Extinguishers.

PART 2 PRODUCTS

- 2.01 Provide NFPA rated A-B-C Multi-Purpose Stored Pressure Dry Chemical Extinguishers as manufactured by AMEREX, or RUSD approved equal. Model # B-443, 6-lb.
1. Include AMEREX mounting bracket and required accessories.

PART 3 -- EXECUTION

- 3.01 Installation: mount extinguisher securely anchored to structurally sound wall components.
- 3.02 Mount extinguisher at 42" above finished floor.
- 3.02 Mount sign directly above extinguished with top of sign at +/- 8' - 0" A F F .
Confirm with Architect on-site prior to installation.

-- END OF SECTION --

DIVISION 13 SPECIAL CONSTRUCTION

Section 13 34 19 Metal Building Systems

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal Framing Components
- B. Metal Wall Panels and Trim
- C. Metal Roof Panels and Trim
- D. Metal Building Accessories

1.2 RELATED SECTIONS

- A. Section 03 15 00- Placement of anchor bolt, leveling plates and grout.
- B. Section 03 30 00- Cast-in-place concrete.
- C. Section 08 36 16 - Overhead doors.
- D. Section 08 50 00 - Windows.
- E. Section 08 60 00 - Skylights, Translucent Panels, Wall lights.
- F. Section 09 90 00 - Painting: Finish painting of primed steel surfaces.

1.3 REFERENCE STANDARDS

- A. American Institute of Steel Construction (AISC):
 - 1. AISC Specification for Structural Steel Buildings.
 - 2. AISC Serviceability Design Considerations for Low-Rise Buildings
- B. American Iron and Steel Institute (AISI):
 - 1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members
- C. American Welding Society (AWS):
 - 1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.
 - 2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel
- D. Association for Iron & Steel Technology (AISE):
 - 1. AISE 13 – Specifications for Design and Construction of Mill Buildings.

E. ASTM International (ASTM):

1. ASTM A 36 – Standard Specification for Carbon Structural Steel
2. ASTM A 48 – Specification for Gray Iron Castings
3. ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4. ASTM A 307 – Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
5. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A 354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
7. ASTM A 475 – Specification for Zinc-Coated Steel Wire Strand
8. ASTM A 490 – Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
9. ASTM A 500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
10. ASTM A 529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
11. ASTM A 563 – Specification for Carbon and Alloy Steel Nuts
12. ASTM A 572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
14. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
15. ASTM A 992 – Standard Specification for Structural Steel Shapes.
16. ASTM A 1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
17. ASTM A 1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
18. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
19. ASTM E 108—Spread-of Flame Testing: Class 1A Rating.
20. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
21. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
22. ASTM E 1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
23. ASTM E 1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
24. ASTM E 1680 – Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
25. ASTM E 2140 – Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
26. ASTM F 436 – Specification for Hardened Steel Washers
27. ASTM F 1145 – Specification for Turnbuckles, Swaged, Welded, Forged
28. ASTM F 1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

F. CSA – Canadian Standards Association

G. CWB – Canadian Welding Bureau

H. IAS – International Accreditation Service

I. LGSI – Light Gauge Steel Institute

J. SJI – Steel Joist Institute

- K. Florida Product Approval: Nucor CFR approved under file number FL4891
- L. FM Global:
 - 1. FMRC Standard 4471 – Approval Standard for Class 1 Roofs for Hail Damage Resistance, Combustibility, and Wind Uplift Resistance.
- M. Metal Building Manufacturers Association (MBMA): MBMA Metal Building Systems Manual
- N. Underwriters Laboratories (UL): UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies

1.4 DEFINITIONS

- A. Metal Building System: A building system that will employ:
 - Either continuous or simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the roof cladding.
 - Simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the steel wall cladding.
 - Three-plate, built-up rigid space frames and/or cold-formed 'C' or hot-rolled I-shaped post-and-beam framing to support the roof and wall secondary members.
 - All systems (cladding, roof and wall secondary, lateral primary framing, and longitudinal bracing) work together to provide resistance to vertical and lateral loading demands.
- B. Gable Symmetrical: A continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (inset in the column line). The rafters may or may not have interior columns.
- C. Roof Slope: Pitch expressed as inches of rise for each 12" of horizontal run.
- D. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).
- E. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.
- F. Building Length: Measured from outside to outside of end wall secondary structural member.
- G. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.
- H. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.
- I. Dead Load: The actual weight of the building system (as provided by the metal building supplier) supported by a given member.
- J. Floor Live Loads: Loads induced on a floor system by occupants of a building and their furniture, equipment, etc.
- K. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.
- L. Roof Snow Loads: Gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.
- M. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.

- N. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

A. General

1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally-recognized groups such as AISC, AISI, AWS, ASTM, CSA, CWB, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.
2. Design structural mill sections and built-up plate sections in accordance with:
 - a. (US) code-appropriate edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ANSI/AISC 360 ASD method.
3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", 2007 Edition, ANSI/AISI S-100-07 or CAN CSA S136-07.
4. Design weldments per the following:
 - a. Structural Welding
 - 1) (US) Design per AWS D1.1, "Structural Welding Code – Steel", Latest Edition.
 - 2) (Canada) Design per CWB W59, "Welded Steel Construction (Metal Arc Welding)", Latest Edition.
 - b. Cold-Formed Welding
 - 1) (US) Design per AWS D1.3, "Structural Welding Code – Sheet Steel", Latest Edition.
 - 2) (Canada) Design per CWB W59, "Welded Steel Construction (Metal Arc Welding)", Latest Edition.

B. Design Code:

1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
 - a. Governing Building Code: IBC - the International Building Code
 - b. Year/Version: 2012
 - c. Occupancy Category: Educational – Group E

C. Design Loads:

1. Dead Load – Weight of the building system as determined by manufacturer.
2. Roof Live Load – 30 pounds per square foot - Uniform
3. Collateral Loads – See Plan Sheet A1.3 for locations
 - a. (2) Unit Heaters; weight each @ 130 lbs.
 - b. (2) Big Ass Fans; weight each @ 100 lbs.
 - c. (12) Lighting Fixtures; weight each @ 15 lbs.
 - d. (7) Drop-Down Electrical retractable outlet cord reels; weight each @ 16 lbs.
 - e. (6) Skylights - . NUCOR Curb Mounted Prismatic Skylights Model No. 4040

4. Roof Snow Load:

- | | | |
|----|---------------------------------|----------------|
| a. | Ground Snow Load: | 30 lbs. per SF |
| b. | Snow Exposure Coefficient (Ce): | 1.1 |
| c. | Thermal Coefficient (Ct): | 1.0 |
| d. | Roof Snow Load: | 37 lbs. per SF |
| e. | Building Importance Category: | II |

a.

5. Wind Load:
 - a. Wind Speed: Gusts to 90 MPH
 - b. Wind Exposure: 'C' Open Exposure 2 sides – East and South

6. Seismic Load:. Per SF
 - a. Spectral response acceleration for short periods (Ss): 0.094 g
 - b. Spectral response acceleration for 1-sec. period (S1): 0.054 g
 - c. Site Class: C

7. Floor Load.
 - a. Live Load: 100 lbs. per SF
 - b. Collateral Loads:
 - (2) Welding Stations; weight each allowance: 750 lbs.
 - (1) Water Heater; weight allowance: 450 lbs.
 - (1) Service Sink; weight allowance 150 lbs.
 - (1) Air Compressor; weight allowance: 500 lbs.

- D. General Serviceability Limits :
 1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
 2. Vertical Deflections:
 - a. Roof Secondary (Purlins) – L/150.
 - b. Main Frame roof beams – L/180.
 3. Horizontal Deflections:
 - a. Wall Secondary (Girts) – L/90.
 - b. Main Frames – H/60.
 4. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.

- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.

- C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, end wall and roof framing, flashing and sheeting, and accessory installation details.

- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

- E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.

- F. *NOTE: Certifications: Shop drawings and design analysis shall bear the seal of a registered professional engineer and be provided to the Architect for the Project Record as part of the Submittal.*
- G. Bill of Materials: Bills of material shall be furnished and shall include item weights.
- H. Preventative Maintenance Manual.
- I. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.
- J. Submit certification verifying that the metal roof system has been tested and approved by Underwriter's Laboratory as Class 90.
- K. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

1.7 QUALITY ASSURANCE

- A. Manufacturer / Fabricator Qualifications:
 - 1. (US) All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer /Fabricator with a minimum of five (5) years' experience.
- B. Weldments/Welder/Weld Inspection Qualifications:
 - 1. (US) Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, "Structural Welding Code – Steel", latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, "Structural Welding Code – Sheet Steel", latest edition.
- C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- D. *NOTE: Design: Standard drawings and design analysis must bear the seal of a registered professional engineer and be provided to the Architect for the Project Record as part of the Submittal.*

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Do not store materials directly on ground.
 - 4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
 - 5. Protect materials and finish during storage, handling, and installation to prevent damage.

- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

- A. Building System Warranty
 - 1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.
 - 2. The manufacturer shall warranty the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
 - 3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event, shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.
- B. Standing Seam Roof Weathertightness Warranty(Optional)
 - 1. Furnish manufacturer's weathertightness warranty for a maximum of 20 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
- C. Roof and Wall Paint Finish Warranty
 - 1. Paint Systems
 - a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
 - b. The warranty shall be for a period of 30 years from the date of shipment for PVDF paint systems.
 - c. The warranty shall be for a period of 25 years from the date of shipment for silicone-polyester paint systems.
 - 2. Galvalume® systems
 - a. Furnish manufacturer's standard warranty for the Galvalume® panels against rupture, structural failure, or perforation due to normal atmospheric conditions.
 - b. The warranty shall be for a period of 20 years from the date of shipment for Galvalume® systems.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Nucor Building Systems; <http://www.nucorbuildingsystems.com>
- B. Substitutions: Not permitted.

2.2 MATERIALS

A. Primary Framing Steel:

1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A-36, A-572 or A-992, with minimum yield of 36 or 50 ksi, respectively.
2. Steel for built-up sections must conform to the requirements of ASTM A-1011, A-1018, A-529, A-572 or A-36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
3. Round Tube must conform to the requirements of ASTM A-500 Grade B with minimum yield strength of 42 ksi.
4. Square and Rectangular Tube must conform to the requirements of ASTM A-500 Grade B with a minimum yield strength of 46 ksi.
5. Steel for Cold-Formed Endwell "C" sections must conform to the requirements of ASTM A-1011 or A-1039 Grade 55, or ASTM A-653 Grade 55 with minimum yield strength of 55 ksi.
6. X-bracing will conform to ASTM A-36 or ASTM A-529 for rod and angle bracing or ASTM A-475 for cable bracing.

B. Secondary Framing Steel:

1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A-1011 or ASTM A-1039 Grade 55 for primed material or ASTM A-653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
2. Design Thicknesses – Gauge to be determined by design to meet specified loading conditions.

C. Panels:

1. Roll-formed Galvalume®, pre-painted Galvalume® or Galvanized G90 Exterior-Side and G60 Interior-Side. In Canada, Galvanized panel will have a coating thickness of G90 on both sides.
2. Standing Seam Panels must have:
 - a. (For US and Export) 50 percent minimum aluminum-zinc alloy- coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
 - b. (For Canada) 55 percent minimum aluminum-zinc alloy- coating with Galvalume® finish or 50 percent minimum aluminum-zinc alloy- coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
3. Through-fastened panels must have:
 - a. (For US and Export) 50 percent minimum aluminum-zinc alloy coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
 - b. (For Canada) 55 percent minimum aluminum-zinc alloy- coating with Galvalume finish or 50 percent minimum aluminum-zinc alloy- coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
4. Panel Finish:
 - a. SP Finish: Modified Siliconized Polyester paint system with a 25-year finish warranty.
 - b. PVDF Finish: 70% PVDF paint system with a 30-year finish warranty.

D. Panel Fasteners:

1. For Galvalume® and Painted finished roof panels: Long Life Cast Zinc head.
2. For wall panels: Coated carbon steel.
3. Color of exposed fastener heads to match the wall and roof panel finish.
4. Concealed Fasteners: Self-drilling type, of size required.

E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

- F. Roof Clips:
1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.
 2. Short or Tall Fixed clips; shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
 3. Short or Tall Sliding clips: shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height and provide either 1-7/8 inches or 3 7/8 inches of travel for panel thermal expansion and contraction, depending on clip choice.
- G. Sealant and Closures:
1. Sidelaps: Factory applied non-skinning Butyl mastic.
 2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
 3. Outside Closures: Closed-cell, plastic or metal
 4. Inside Closures: Closed-cell, plastic or metal

2.3 PRIMARY FRAMING

- A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.
1. Frame Design: Gable Symmetrical.
 2. Frame Type: Clear-Span.
- B. Rigid Frame Columns:
1. Tapered
- C. Rigid Frame Rafters:
1. Straight/Uniform depth
- D. Endwell Frames / Roof Beams: Fabricated as mill-rolled sections or built-up "I" sections depending on design requirements. Fabricate end wall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.
- E. Finish: Red-Oxide or Gray Primer, or galvanized (pre-coated galvanized cold-form, hot-dipped otherwise).
- F. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM A-325 or A-490 depending on design requirement.

2.4 SECONDARY FRAMING

- A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI and LGSI. They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin/girt webs, not purlin/girt flanges.
- B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.
1. Depth: To be determined by design (8", 10" or 12")
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.

- C. Girts: Horizontal structural members that support vertical panels.
 - 1. Depth: To be determined by design (8", 10", or 12")
 - 2. Maximum Length: To be determined by design.
 - 3. Finish: Red Oxide Primer.
 - 4. Finish: Gray Primer.
 - 5. Finish: Pre-Coated Galvanized.

- D. Eave Struts: Unequal flange, cold-formed "C" sections or "Z" purlins.
 - 1. Depth: To be determined by design (8", 10" or 12")
 - 2. Maximum Length: To be determined by design.
 - 3. Finish: Red Oxide Primer.
 - 4. Finish: Gray Primer.
 - 5. Finish: Pre-Coated Galvanized.

- E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
 - 1. Formed base sill.
 - 2. Base channel.
 - a. With flashing.
 - 3. Base angle.
 - a. With flashing.
 - 4. Base girt.
 - a. With flashing.
 - 5. Finish: Red Oxide Primer.
 - 6. Finish: Gray Primer.
 - 7. Finish: Pre-Coated Galvanized.

- F. Nucor Building Systems roof joist system.
 - 1. Open web, parallel chord, simple span load carrying members suitable for the direct support of roof systems utilizing material sizes and yield strengths as required.
 - 2. Bridging – by Design
 - 3. Joist attachment
 - a. Alt. Bolted (Some welding required)
 - 4. Open web members shall be fabricated of material that conforms to the material specifications designated by the Steel Joist Institute as acceptable for this product.

2.5 ROOF PANELS

- A. Nucor Classic Roof™ Panel: A through-fastened roof with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - 1. Gauge: 24.
 - 2. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 - 3. Finish/Color: As specified in Article 2.8 PANEL FINISH.

2.6 WALL PANELS

- A. Nucor Classic™ Wall Panel: A through-fastened sidewall panel with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - 1. Gauge: 24.
 - 2. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 - 3. Finish/Color: As specified in Article 2.8 PANEL FINISH.

2.7 ACCESSORIES

- A. Roof Line Trim:
 - 1. Trim Type: Simple Eave/Rake Trim.
- B. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.
- C. Framed Openings: Used to frame out doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.
- D. Walk Doors: Personnel entry doors.
 - 1. Size: 3'-6" x 7'-0"
 - 2. With heavy Duty Closer
 - 3. OK to provide NORCO Standard Locksets ONLY IF cylinder may be changed-out for Schlage. Re-Keying by RUSD. See Section 08 71 00
 - 4. Accessories: As noted on the Contract
- E. Daylighting with Prismatic Skylights:
 - 1. Curb Mounted Prismatic Skylights (6) required; Size: 4040; as Alternate Bid No. 1
- F. Roof Vents: General Contractor shall verify requirements for Unit Heaters; Water Heater, and Welding Stations Exhaust Fan.

2.8 PANEL FINISHES

- A. Roof Panel:
 - 1. Galvalume® (GM)
- B. Wall Panel:
 - 1. Nucor Standard Panel Paint System (Siliconized Polyester Resin, 25-year Finish Warranty):
 - a. Color: Sagebrush Tan (SB)

2.9 FABRICATION

- A. General:
 - 1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
 - 2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
 - 3. All framing members must carry an identifying mark.
- B. Primary Framing:
 - 1. Plates, Stiffeners and Related Members.: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.
 - 2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.
 - 3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
 - 4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.

5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.
- C. Zee Purlins:
1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.
- D. Girts
1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.
- E. Bracing:
1. Diagonal Bracing:
 - a. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
 - b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.
 2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.
 3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.
 4. Bridging:
 - a. Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.
- F. Standing Seam Panels - General:
1. One side of the panel is configured as female, having factory applied hot-melt mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming a weathertight seam.
 2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.
 3. Maximum panel length is 55 feet (16,764mm) unless otherwise noted in the Contract Documents.
- G. Documents.
1. Endlaps:
 - a. Endlaps must have a 16-gauge backup plate and have the four endlap joint fasteners installed in four pre-punched holes in the flat.
 - b. Apply mastic between the panels and secured with #17-14 x 1 1/4 inch (32mm) self-tapping fasteners through the panels, and backup plate to form a compression joint.
 - c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment's to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.3 INSTALLATION

- A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.
- B. Erection practices shall conform to "Common Industry Practices", Section 6, MBMA (LR)-Building Systems Manual.
- C. There shall be no field modifications to primary structural members except as authorized and specified by manufacturer.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 22 - PLUMBING

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Supports and anchorages.

1.02 DEFINITIONS

A. Abbreviations for materials

1. Plastic materials: PVC: Polyvinyl chloride plastic.
2. Rubber materials: EPDM: Ethylene-propylene-diene terpolymer rubber.
NBR: Acrylonitrile-butadiene rubber.

1.03 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Welding certificates.

1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided if such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.05 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.

1.06 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordination Meetings: Attend coordination meetings with the construction manager and all other trades for the purpose of coordinating the locations of all fire protection, plumbing, HVAC and electrical work for the entire project. The goal of these meetings is to avoid conflicts between trades in the field.
 - 1. Conflicts Between Trades: Resolve all conflicts with other trades at no additional cost to the Owner or Architect.
- D. This Contractor shall completely cooperate with all other trades in the matter of planning and executing of the work. Every reasonable effort shall be made to prevent conflict and interferences as to space requirements, dimensions, locations, openings, sleeving or other matters which tend to delay or obstruct the work of a trade.

1.07 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. These specifications and attendant drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material necessary for the proper execution of the work in accordance with present practices of the trade shall not relieve the Contractor from providing such additional labor and materials.
- B. The drawings depicting plumbing work are diagrammatic and show, in their approximate location, symbols representing plumbing equipment and devices. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect and/or established by manufacturer's installation drawings and details.
 - 1. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring plumbing connections to verify rough-in and connection locations.
 - 2. Unless specifically stated to the contrary, no measurement of a plumbing drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the plumbing drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.
- C. The drawings do not attempt to show the complete plumbing details of building construction which affect the installation. The Contractor shall refer to plans of other trades for additional details which affect the proper installation of this work. Bring any discrepancies to the attention of the Architect for resolution. The Contractor is cautioned that diagrams showing plumbing connections and/or piping are diagrammatic only and must not be used for obtaining lineal runs of piping. Piping diagrams do not necessarily show the exact physical arrangement of the equipment.

1.08 EXAMINATION OF PLANS, SPECIFICATIONS AND SITE

- A. Before submitting a bid, the Contractor shall visit the site and familiarize himself with all features of the building and site, which may affect the execution of his work. No extra payment will be allowed for the failure to obtain this information. If in the opinion of the Contractor there are omissions or errors in the plans or specifications, the Contractor shall clarify these points with the Architect before submitting his bid. In lieu of written clarification by addendum, the contractor shall resolve all conflicts in favor of the greater quantity or better quality.

1.09 DEMOLITION, RENOVATION AND DISPOSITION OF EXISTING EQUIPMENT.

- A. Plumbing equipment in conflict with construction shall be removed and/or relocated as indicated on the drawings, as directed or required. This Contractor shall remove all plumbing equipment released from service as a result of construction, and no equipment removed shall be reused, except as specifically directed on the drawings or elsewhere herein. Except for piping and miscellaneous hardware, all plumbing equipment shall remain the property of the Owner and shall be stored on the site for removal by the Owner. All other piping and equipment removed shall become the property of this Contractor and shall be removed from the site.
- B. This Contractor shall be responsible for the work of other trades as may be necessary to facilitate the installation of plumbing work in the existing building. Such work necessary that is normally done by other trades and is not covered as a part of other Divisions of the work shall be done under the direction and at the expense of the Plumbing Contractor. This work shall include but is not limited to, cutting, patching, and refinishing and all necessary and required to leave existing building in condition acceptable to the Architect.
- C. Any existing fixtures or equipment not shown on the drawings and which are logically expected to be continued in service and which may be interrupted or disturbed during construction shall be reconnected in an approved manner. In addition, any existing fixture or equipment which may require relocation or re-routing, as a result of construction, shall be considered a part of the work of this branch and shall be done by this Contractor with no additional compensation.
- D. All coring that is required for plumbing work shall be by this Contractor.
- E. All equipment containing hazardous materials removed during the project become the Contractor's property and he shall dispose of them in accordance with applicable DNR and EPA regulations.
- F. Piping which is to remain in service, but which is presently routed through areas being demolished shall be rerouted around demolition area.

PART 2 - PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

- 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.

2.02 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. 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.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.03 TRANSITION COUPLINGS:

- A. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Unshielded, Non-pressure Transition Couplings: ASTM C 1173; elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Sleeve Materials:
 - a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- D. Shielded, Non-pressure Transition Couplings: ASTM C 1460; elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Pressure Transition Couplings: AWWA C219; corrosion-resistant metal sleeve-type with ductile iron center-sleeve and rubber gasket. Coupling shall be same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.

2.04 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating non-conductive insulating material. Include end connections compatible with pipes to be joined.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: ASSE 1079; factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Flanges: ASSE 1079; factory-fabricated, bolted, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Nipples: IAPMO PS 66; electroplated steel nipple complying with ASTM F 1545 with inert and non-corrosive, propylene lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.05 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Metraflex Co.
 - 3. Pipeline Seal and Insulator, Inc.

- B. Description: Modular sealing element unit, designed for field assembly, for filling annular space between pipe and sleeve.
1. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Glass-reinforced plastic.
 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.06 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD

2.07 SLEEVES

- A. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with set screws.
- F. Molded PVC Sleeves: With nailing flange for attaching to wooden forms.
- G. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- H. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.08 ESCUTCHEONS AND FLOOR PLATES

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.
- D. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- E. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.
- F. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.
- G. One-Piece, Floor-Plates: Cast-iron floor plate.
- H. Split-Casting, Floor-Plates: Cast brass with concealed hinge.

2.09 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 PLUMBING DEMOLITION

A. Refer to Division 1 Sections for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components unless noted otherwise.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.02 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
1. Escutcheons for New Piping: One-piece, cast-brass type with polished, chrome-plated finish, except as follows:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
 - c. Bare Piping in Unfinished Service Spaces and Equipment Rooms: One-piece, cast brass type with polished, chrome-plated or rough-brass finish.
 2. Escutcheons for Existing Piping: Split-casting brass type with polished, chrome-plated finish, except as follows:
 - a. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
 - b. Bare Piping in Unfinished Service Spaces and Equipment Rooms: Split-casting brass type with polished, chrome-plated or rough-brass finish.
- M. Install floor plates for piping penetrations of equipment-room floors.
- N. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening. 1. New Piping: One-piece, floor-plate type. 2. Existing Piping: Split-casting, floor-plate type.

3.03 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls. 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
 2. Cut sleeves to length for mounting flush with both surfaces. a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

3.04 STACK-SLEEVE-FITTING INSTALLATION

- A. Install stack-sleeve fittings in new slabs as slabs are constructed.
1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 2. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
 3. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 4. Using grout, seal the space around outside of stack-sleeve fittings.
- B. Fire-Barrier Penetrations: Seal pipe penetrations with firestop materials.

3.05 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.06 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

3.07 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using leadfree solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 3. PVC Non-pressure Piping: Join according to ASTM D 2855.

3.08 PIPING CONNECTIONS

- A. Verify final equipment locations for roughing-in.
- B. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- C. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.09 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

3.13 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION

SECTION 22 05 23 GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze swing check valves.
3. Bronze gate valves.

1.02 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. RS: Rising stem.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Handwheel: For valves other than quarter-turn types.
 - 2. Hand lever: For quarter-turn valves NPS 6 and smaller.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features: Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- F. Valve-End Connections: Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.02 BRONZE VALVES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ball Valves: Apollo Valves, Hammond Valve, Milwaukee Valve Company, NIBCO.
 - 2. Gate Valves: Hammond Valve, Milwaukee Valve Company, NIBCO.
 - 3. Check Valves: Hammond Valve, Milwaukee Valve Company, NIBCO, Watts.
- B. Bronze Ball Valves: MSS SP-110, three-piece bronze body with threaded ends, chrome-plated bronze ball, PTFE or TFE seat, 600 psig minimum CWP rating and blowout-proof bronze stem. NPS 2 and smaller: Full port.
- C. Bronze Swing Check Valves: MSS SP-80, Type 3, Class 125. ASTM B 62 bronze body with renewable bronze disc and seat, threaded ends; suitable for installation in a horizontal or vertical line with upward flow.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.02 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows: Swing Check Valves: In horizontal position with hinge pin level or in vertical piping with upward flow.

3.03 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or, butterfly valves.
 - 2. Throttling Service: Ball, or butterfly valves.
 - 3. Pump-Discharge Check Valves: a. NPS 1-1/2 and Smaller:
Bronze swing check valves with bronze disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.05 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Two or Three piece, full port, bronze with stainless-steel trim.
 - 3. Bronze Swing Check Valves: Class 125, bronze disc.
 - 4. Bronze Gate Valves: Class 125, RS.

END OF SECTION

SECTION 22 05 29 HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe positioning systems.
7. Equipment supports.

1.02 DEFINITION: MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.03 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.04 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.02 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.03 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper B-Line, Inc.
 - b. Flex-Strut Inc.
 - c. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with in-turned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

2.04 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.05 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.06 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.07 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon steel shapes.

2.08 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Non-staining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation: Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Shield Dimensions for Pipe: Not less than the following: a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
4. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.02 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.03 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.04 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.06 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8.
 - 6. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 7. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 2. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 3. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- L. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 11/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
- M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- O. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 22 05 53 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.02 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch or aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 21/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch-thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 21/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws. 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.03 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.04 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses. Valve-tag schedule shall be included in operation and maintenance data.

2.05 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
1. Size: 3 by 5-1/4 inches minimum.
 2. Fasteners: Brass grommet and wire.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping, if applicable, is specified in Division 09.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
1. Domestic Cold Water Piping:
 - a. Background Color: Dark Green.
 - b. Letter Color: White.
 2. Domestic Hot Water and Hot Water Return Piping:
 - a. Background Color: Light Green.
 - b. Letter Color: White.
 3. Fuel Gas Piping:
 - a. Background Color: Black.
 - b. Letter Color: Yellow.

3.04 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape: 1-1/2 inches, round. 2. Letter Color: Black

3.05 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 22 07 19 PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.

1.02 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components: Supply and Drain Protective Shielding Guards: ICC A117.1.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.04 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.05 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule, articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Micro-Lok HP.Knauf Insulation; 1000-Degree Pipe Insulation with ECOSE Technology Owens Corning
 - b. Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.02 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.03 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A. with VOC limit for indoor applications: 80 g/L.
- D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints. VOC limit for indoor applications: 50 g/L.
- E. PVC Jacket Adhesive: Compatible with PVC jacket. 1. VOC limit for indoor applications: 50 g/L.

2.04 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II; VOC limit for indoor applications: 50 g/L.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: 60 percent by volume and 66 percent by weight.
4. Color: White.

2.05 SEALANTS

A. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. VOC limit for indoor applications: 420 g/L.

2.06 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following: ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.07 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.08 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.09 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015-inch-thick, 3/4-inch-wide with wing seal or closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch-thick, 3/4-inch-wide with wing seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGuire Manufacturing.
 - b. Truebro; a brand of IPS Corporation.
 - c. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c. a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.04 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. 1. Comply with requirements in Division 07 for firestopping and fire-resistive joint sealers.

3.05 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 - 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.06 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.07 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.08 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation Material: Mineral fiber
2. Insulation Thickness: 1 inch thick minimum.
3. Factory-Applied Jacket: ASJ-SSL.
4. Field-Applied Jacket: PVC on exposed piping in mechanical rooms or within 10' of floor in occupied spaces.
5. Vapor Barrier Required: Yes.

B. Domestic Hot and Recirculated Hot Water:

1. Insulation Material: Mineral fiber
2. Insulation Thickness:
 - a. NPS 1-1/2 and Smaller: 1 inch thick min.
 - b. NPS 2 and Larger: 2-inch-thick min.
3. Factory-Applied Jacket: ASJ-SSL.
4. Field-Applied Jacket: PVC on exposed piping in mechanical rooms or within 10' of floor in occupied spaces.
5. Vapor Barrier Required: No.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. Insulation Material: Mineral fiber
2. Insulation Thickness: 1/2-inch-thick minimum.

END OF SECTION

SECTION 22 11 10 FACILITY NATURAL GAS PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.02 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.

1.03 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings: Piping and Valves: 100 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
1. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
 2. Pressure regulators. Indicate pressure ratings and capacities.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.
- B. Welding certificates.
- C. Field quality-control reports.

1.06 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. 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.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.09 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.01 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

a. Material Group: 1.1.

b. End Connections: Threaded or butt welding to match pipe.

c. Lapped Face: Not permitted underground.

d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum O-rings, and spiral-wound metal gaskets. e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

2.02 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.

2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.

- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 - 1. Copper-alloy convenience outlet and matching plug connector.
 - 2. Nitrile seals.
 - 3. Hand operated with automatic shutoff when disconnected.
 - 4. For indoor or outdoor applications. 5. Adjustable, retractable restraining cable.
- C. Y-Pattern Strainers:
 - 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 - 2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
 - 3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
 - 4. CWP Rating: 125 psig.

2.03 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.04 MANUAL GAS SHUTOFF VALVES

- A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.
 - 1. CWP Rating: 125 psig.
 - 2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
 - 3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - d. McDonald, A. Y. Mfg. Co. Perfection Corporation; a subsidiary of American Meter Company.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lee Brass Company.
 - b. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McDonald, A. Y. Mfg. Co.
 - b. Mueller Co.; Gas Products Div.
 - c. Xomox Corporation; a Crane company.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flowserve.
 - b. Homestead Valve; a division of Olson Technologies, Inc.
 - c. McDonald, A. Y. Mfg. Co.
 - d. Milliken Valve Company.
 - e. Mueller Co.; Gas Products Div.
 - f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig. 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction. 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.05 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Meter Company.
 - b. Fisher Control Valves and Regulators; Division of Emerson Process Management.
 - c. Maxitrol Company.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Corporation; Controls Div.
 - b. Maxitrol Company.
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Close equipment shutoff valves before turning off natural gas to premises or piping section.
- B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code] to determine that natural-gas utilization devices are turned off in piping section affected.
- C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.03 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Steel Piping with Protective Coating: Apply joint cover kits to pipe after joining to cover, seal, and protect joints.

3.04 INDOOR PIPING INSTALLATION

- A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.
 - 1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
 - 2. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports. a. Exception: Tubing passing through partitions or walls does not require striker barriers.
 - 3. Prohibited Locations:
 - a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
 - b. Do not install natural-gas piping in solid walls or partitions.
- Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- R. Connect branch piping from top or side of horizontal piping.
- S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- T. Do not use natural-gas piping as grounding electrode.
- U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- V. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors.
- X. Install sleeve seals for piping penetrations of concrete walls and slabs.

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.05 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.06 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
 - 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
 - 5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 - 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 - 2. Bevel plain ends of steel pipe.
 - 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.07 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.

3.08 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.09 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

- A. Comply with requirements in Division 09 for painting interior and exterior natural-gas piping.
- B. Paint exposed, exterior metal piping, valves, and piping specialties, except components, with factory-applied paint or protective coating.
 - 1. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (gloss).
 - d. Color: Gray and OSHA yellow for piping run on roof.
- C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections: Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.
- C. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints (NPS 2-1/2 and smaller).
 - 2. Steel pipe with wrought-steel fittings and welded joints (NPS 3).

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 2-1/2 and smaller shall be the following: Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints (NPS 2-1/2 and smaller).
 - 2. Steel pipe with wrought-steel fittings and welded joints (NPS 3).

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

- A. Aboveground, branch piping NPS 2-1/2 and smaller shall be the following: 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints (NPS 2-1/2 and smaller).
 - 2. Steel pipe with steel welding fittings and welded joints (NPS 3).

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
- B. Distribution piping valves for pipe sizes NPS 2-1/2-3 shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.
 - 3. Cast-iron, nonlubricated plug valve.
- C. Valves in branch piping for single appliance shall be one of the following:
 - 1. Two-piece, full-port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

END OF SECTION

PART 1 - GENERAL

A. Section Includes:

1. Aboveground and under-building-slab domestic water pipes, tubes, and fittings inside buildings.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61.

2.02 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

2.03 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys.

B. Flux: ASTM B 813, water flushable.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general duty brazing unless otherwise indicated.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 Section "Domestic Water Piping Specialties."

- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Division 22 Section "Domestic Water Piping Specialties."
- F. Install domestic water piping level without pitch and plumb.
- G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- K. Install piping to permit valve servicing.
- L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Common Work Results for Plumbing."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Common Work Results for Plumbing."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Common Work Results for Plumbing."

3.02 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.03 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install supports for vertical steel piping every 15 feet.

3.04 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements for connection sizes in Division 22 plumbing fixture Sections.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.05 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.06 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.07 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use. 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.08 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.09 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping:
1. NPS 2 and smaller, shall be one of the following:
 2. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
 3. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed or soldered joints.

3.10 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller.
 2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller.
 3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
 4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 22 11 19 DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Water mixing valves.
5. Strainers.
6. Drain valves.
7. Water-hammer arresters.
8. Air vents.
9. Flexible connectors.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties; Include diagrams for power, signal, and control wiring.

1.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.02 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.03 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
 - c. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
 - c. Woodford Manufacturing Company; a division of WCM Industries, Inc.
 - d. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

2.04 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Watts model 9D or comparable product by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
2. Standard: ASSE 1012.
3. Operation: Continuous-pressure applications.
4. Size: NPS 3/4.
5. Body: Bronze.
6. End Connections: Union, solder joint.
7. Finish: Rough bronze. a. Connection.

2.05 WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lawler Manufacturing Company, Inc.
 - b. Leonard Valve Company.
 - c. Powers; a division of Watts Water Technologies, Inc.
2. Standard: ASSE 1070, thermostatically controlled, water tempering valve.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Body: Bronze body with corrosion-resistant interior components.
5. Temperature Control: Adjustable.
6. Inlets and Outlet: Threaded.
7. Finish: Rough or chrome-plated bronze.
8. Tempered-Water Setting: 115.
9. Tempered-Water Design Flow Rate: 2.2 gpm or less.

2.06 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size: Strainers NPS 2 and Smaller: 0.033 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.07 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.08 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Company, Inc.
 - d. Watts Drainage Products.
 - e. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.09 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.
2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet. 6. Inlet and Vent Outlet End Connections: Threaded.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hyspan Precision Products, Inc.
2. Metraflex, Inc.

- B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve and pump.
- E. Install water-hammer arresters in water piping according to PDI-WH 201.
- F. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

3.02 CONNECTIONS

- A. Comply with requirements for piping specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Comply with requirements for ground equipment in Division 26.
- C. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections: Test each reduced-pressure-principle backflow preventer and double-check, detector assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.04 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

SECTION 22 13 16 SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Pipe, tube, & fittings; Specialty pipe fittings.

1.02 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure otherwise indicated: Soil, Waste, and Vent Piping: 10-foot head of water.

1.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.01 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.03 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Heavy-Duty, Hubless-Piping Couplings: ASTM C 1277 and ASTM C 1540; stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop

2.04 COPPER TUBE AND FITTINGS

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.

D. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

- E. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

F. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.05 PVC PIPE AND FITTINGS (FOR USE IN BELOW SLAB PIPING ONLY)

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: per ASTM F 656: shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Solvent Cement: per ASTM D 2564: PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 EXECUTION

3.01 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- O. Install underground PVC piping according to ASTM D 2321.
- P. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Common Work Results for Plumbing."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Common Work Results for Plumbing."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Common Work Results for Plumbing."

3.03 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- E. Plastic, Non-pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.04 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
 2. In Drainage Piping: Shielded, non-pressure transition couplings.
- B. Dielectric Fittings: Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.05 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. 5. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 2. NPS 3: 60 inches with 1/2-inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 3. NPS 2-1/2: 108 inches with 1/2-inch rod.
 4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
- H. Install supports for vertical copper tubing every 10 feet.

3.06 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Comply with requirements for cleanouts and drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
 - 6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.07 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.08 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained. 6. Prepare reports for tests and required corrective action.

3.09 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, Soil, Waste and Vent Piping: Use any of the following piping materials for each size range:
 1. NPS 4 and smaller:
 - a. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 - b. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 - c. Copper DWV tube, copper drainage fittings, and soldered joints.
 - d. Option for Vent Piping, NPS 2-1/2 and NPS 3: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
 - e. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.
- C. Underground, Soil, Waste, and Vent Piping: Use any of the following piping materials:
 1. NPS 4 and smaller shall be any of the following:
 2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, non-pressure transition couplings.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. Trench drains.
4. Roof flashing assemblies.
5. Through-penetration firestop assemblies.
6. Miscellaneous sanitary drainage piping specialties.
7. Flashing materials. 8. Grease interceptors.

1.02 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. HDPE: High-density polyethylene plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.03 ACTION SUBMITTALS: Product Data for each type of product indicated.

1.04 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.05 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.01 CLEANOUTS

A. Metal Floor Cleanouts FCO:

1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Clamping Device: Required.
6. Outlet Connection: Spigot.
7. Closure: Stainless steel plug with straight threads and gasket.
8. Adjustable Housing Material: Stainless steel with threads.
9. Frame and Cover Material and Finish: Stainless steel.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to clean-out.
13. Standard: ASME A112.3.1.

2.02 FLOOR DRAINS

A. Cast-Iron Floor Drains FD-1:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 - d. Zurn Plumbing Products Group
2. Standard: ASME A112.6.3.
3. Body Material: Cast Iron.
4. Clamping Device: Required.
5. Outlet: Bottom.
6. Top of Body and Strainer Finish: Adjustable, nickel bronze with vandal proof screws.
7. Top Shape: Round.

2.03 FLASHING ASSEMBLIES

- A. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting; Open-Top Vent Cap: Without cap.

2.04 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

- A. Open Drains: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets. Size: Same as connected waste piping with increaser fitting of size indicated.
- B. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping.
1. Size: Same as connected waste piping.
 - a. NPS 2: 4-inch- minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Same size as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe. Size: Same as connected stack vent or vent stack.

E. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe. Size: Same as connected stack vent or vent stack.

F. Frost-Resistant Vent Terminals: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.

1. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

2.07 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated. Applications: 12 oz./sq. ft.. 2. Vent Pipe Flashing: 8 oz./sq. ft..

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 - 1. Position floor drains for easy access and maintenance.
 - 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1 inch total depression.
 - 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 - 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- G. Install through-penetration firestop assemblies in stacks at floor penetrations.
- H. Assemble open drain fittings and install with top of hub 1 inch above floor.
- I. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- K. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- L. Install frost-resistant vent terminals on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.
- M. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
- N. Install wood-blocking reinforcement for wall-mounting-type specialties.
- O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.03 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07.
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.04 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each Solids Interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.05 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.06 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 34 36 COMMERCIAL, HIGH-EFFICIENCY, GAS DOMESTIC WATER HEATERS

PART 1 GENERAL

- 1.01 Provide one (1) gas-fired water heater in the general location shown on the Floor Plan.
- 1.02 Provide all required and incidental materials, components, piping, venting, and connections for a complete installation.
- 1.03 QUALITY ASSURANCE
 - A. Condensate piping specialties shall bear label, stamp, or other markings of specified testing agency.
 - B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.
- 1.04 COORDINATION
 - A. Coordinate size and location of installation requirements with the General Contractor and the Electrical Contractor.
 - B. Coordinate size and location of roof / wall penetrations.

PART 2 - PRODUCTS

- 2.01 Rheem RTGH-90DVLN Prestige Condensing Tankless Direct Vent Indoor Water Heater. SKU: RTGH-90DVLN

PART 3 - EXECUTION

- 3.01
 - A. Install wood-blocking reinforcement for wall-mounting-type specialties.
 - B. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- 3.02 CONNECTIONS
 - A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
 - B. Install piping adjacent to equipment to allow service and maintenance.
- 3.03 FLASHING INSTALLATION
 - A. Install flashing on pipes, sleeves, and specialties passing through walls or roof with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - B. Set flashing on roofs in solid coating of bituminous cement.
 - C. Secure flashing into sleeve and specialty clamping ring or device.

- D. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07.
- E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.04 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each Solids Interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.05 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.06 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

Section 22 42 16 Commercial Lavatories and Sinks

PART 1 - GENERAL

1.01 Provide and install (1) Service Sink. See Floor Plan for location

- A. location may be adjusted in consultation with RUSD Representative and Architect per on-site discussion at time of Rough-In..

PART 2 - PRODUCTS

2.01 Service Sink: SWAN Model # MF-2F Laundry Tub; standard color.

2.02 Faucet: CHICAGO FAUCETS Model # 1895-L9ABCProvide all P

- A. Provide ADA-Compliant Handles

PART 3 - EXECUTION

3.01 Install in compliance with all applicable product manufacturer's instructions, Code Requirements, industry standards, and best trade practices.

3.02 Provide all required and incidental components, fittings, piping, etc. for a complete installation.

END OF SECTION

Section 22 45 26 Eye / Face Wash Equipment

PART 1 - GENERAL

1.01 Provide and Install (1) Eyewash Station. See Floor Plan for location

- A. location may be adjusted in consultation with RUSD Representative and Architect per on-site discussion at time of Rough-In.

PART 2 - PRODUCTS

2.01 Guardian Model # G1825 Pedestal-mounted Eyewash Station with Stainless Steel Bowl.
(gesafety.com)

- A. Include Optional additional components:
 - 1. BC Stainless steel bowl cover
 - 2. DC Stainless Steel dust cover for each spray head

PART 3 - EXECUTION

- 3.01 Install in compliance with all applicable product manufacturer's instructions, Code Requirements, industry standards, and best trade practices.
- 3.02 Provide all required and incidental components, fittings, piping, etc. for a complete installation.

END OF SECTION

DIVISION 23 – HEATING, VENTILATING, and AIR CONDITIONING (HVAC)

Section 23 81 00 DECENTRALIZED Unitary HVAC Equipment

PART 1 GENERAL

- 1.01 Provide & Install two (2) gas-fired Unit Heaters. See locations on Lighting & Electrical Plan.

PART 2 PRODUCTS

- 2.01 Units shall be Modine Effinity 93 Condensing Unit Heaters Model PTC

- 2.02

		Unit Tag
Model Number	PTC 85AS0111FBAN	
Quantity of Units	1	
Btu/Hr Input	85,000	
Btu/Hr Output	79,050	
CFM	1650	
Altitude	0-2000	
Temperature Rise (degrees F)	44	
External Static Pressure (E.S.P)	0.00	
Total Static Pressure (T.S.P.)	0.00	
Gas Type	Natural	
Gas Control Type	Single Stage, Direct Spark Ignition, 100% Shut-Off with Continuous Retry	
Supply Voltage	115/60/1	
Control Voltage	24V	
Motor HP	1/8	
Motor RPM	1625	
Blower RPM	N/A	
Heat Exchanger Type	Aluminized Steel Heat Exchanger/Burner	

Model	Description
PTC 85AS0111FBAN	Propeller Unit Heater
65795	PTC 85AS0111FBAN

- 2.03 Product Type; PTC - Separated Combustion, High Efficiency Condensing Propeller Unit
- 2.04 Furnace Input Rating 85 - 85,000 btu
- 2.05 Heat Exchanger Type: A - Aluminized Steel Heat Exchanger and Burner
- 2.06 Pilot Ignition; S – Direct Spark Ignition

- 2.07 Motor and Drive Code (Power Code); 01 - 115V motor
- 2.08 Gas and Valve/Ignition Control Type (Control Code)
- 2.09 Natural, Single Stage, Direct Spark Ignition, 100% Shut-Off with Continuous Retry
- 2.10 General Performance Data

Model	PTC 85
At 0' Elevation	
Btu/Hr. Input	85,000
Btu/Hr. Output	79,050
Entering Airflow (CFM)	1650
Outlet Velocity	619
Air Temp. Rise (°F)	44
Mounting Height (Max Ft.) ¹	13
Heat Throw (Max. Mtg. Ft.) ²	48
Unit Total Power (Amps)	4.35
Condensate Produced (gal/hr)	0.5
As Configured at 0-2000 Ft. Elevation	
Btu/Hr. Input	85,000
Btu/Hr. Output	79,050
Configured Air Temp Rise (°F)	44
Motor Data	
Horse Power	1/8
RPM	1625
Type	P.S.C.
Motor Amps at 115V	2.20
Clearances to Combustibles	
Top and Bottom	6"
Vent/Combustion Air Connector	6"
Access Side	6"
Non-Access Side	6"
Rear	18"

¹ At 65°F ambient and unit fired at full-rated input. Mounting height as measured from bottom of unit.

² Heat Throws are calculated at 65°F ambient with a 44°F air temperature rise with the unit mounted at a maximum mounting height of 13 feet.

- 2.11 Shipping Weight: 125 lbs
- 2.12 Standards: ETL design certification for use in both the US and Canada to the ANSI Z83.8 - latest revision, standard for "Gas Unit Heater and Gas-Fired Duct Furnaces" for safe operation, construction, and performance
- 2.13 Mechanical Configuration: Condensing furnace section with 93% minimum efficiency provided by an indirect-fired tubular heat exchanger with individually fired tubes coupled to a secondary recuperative heat exchanger for maximum heat recovery.

- 2.14 Venting/Combustion Air Arrangement: The unit shall be separated combustion. The venting shall be a power exhausted arrangement with a separate combustion air intake pipe connection to allow for fresh combustion air from outside the conditioned space. The unit shall be tested to insure proper ignition when the unit is subjected to 40 mile per hour wind velocities. The unit shall also include a factory mounted differential pressure switch designed to prevent main burner ignition until positive venting has been proven.
- 2.15 Venting shall be Schedule 40 PVC. For Canadian installations, all vent pipe and components must be approved to ULC S636.
- 2.16 Unit Casing: The unit heater(s) casing shall be constructed of not less than 20 gauge aluminized steel with minimization of exposed fasteners. All exterior casing parts shall be cleaned of all oils and a phosphate coating applied prior to painting. The exterior casing parts shall then be painted with an electrostatically applied baked-on gray-green polyester powder paint (7-mil thickness) for corrosion resistance.
- 2.17 The unit shall be furnished with horizontal air deflectors. The deflectors are adjustable to provide for horizontal directional airflow control (up or down).
- 2.18 Furnace Section: The heat exchanger(s) shall be made of 18-gauge aluminized steel tubes and headers. Each heat exchanger tube shall be individually and directly flame-fired. The heat exchanger tube shall be crimped to allow for thermal expansion and contraction. The flue collector box shall be made of 20 gauge AL29-4C stainless steel.
- 2.19 Efficiency: The thermal efficiency of the unit(s) shall be a minimum of 93% efficient for all air flow ranges through the use of a secondary recuperative heat exchanger. The secondary heat exchanger shall be constructed of AL29-4C stainless steel to withstand the corrosive environment of condensing gas fired equipment.
- 2.20 The heat exchanger(s) seams and duct connections shall be certified to withstand 0.9" W.C. external static pressure without burner flame disturbance.
- 2.21 The burner(s) shall be in-shot type, directly firing each heat exchanger tube individually and is designed for good lighting characteristics without noise of extinction for both natural and propane gas.
- 2.22 The ignition controller(s) shall be 100% shut-off with continuous retry.
- 2.23 The gas pressure shall be between 6-7" W.C for natural gas.
- 2.24 The solid-state ignition system shall directly light the gas by means of a direct spark igniter each time the system is energized.
- 2.25 The unit gas controls shall be provided with the following:
- A. Single-stage gas controls with a single-stage combination gas control, an ignition control. The unit fires at 100% full fire based on a call for heat from a room thermostat.
 - B. An automatic reset high limit switch mounted in the air stream to shut off the gas supply in the event of overheating.
 - C. An automatic reset high limit switch mounted on the power exhaustor housing to shut off the gas supply in the event of overheating flue gas temperatures.
 - D. A condensate drain line overflow switch that senses if the condensate line is clogged and shuts the unit heater down. The switch is factory mounted inside the unit cabinet and wired to the unit controls.

- E. An energy-saver control utilizes stratified ceiling air to heat the space at floor level before turning on the gas controls. Its operation is independent of the room thermostat and should have a higher set-point than the room thermostat. The Stat is factory mounted outside the unit and wired into the contractor convenience box.
- F. A time delay relay that delays the start of the air mover to allow the heat exchanger a warm-up period after a call for heat. The time delay relay shall also continue the air mover operation after the thermostat has been satisfied to remove any residual heat in the heat exchanger.
- G. The unit shall be ordered for 0-2000 feet elevation above sea level.

2.25 Electrical

- A. All electrical components shall carry UL, ETL, or CSA listing.
- B. A low voltage terminal board shall be provided for direct wiring connection to an external thermostat.
- C. A Contractor Convenience Package that consists of an external junction box featuring simple connection of supply power wiring internally, thermostat wiring to terminals externally, an On/Off switch, a single 115V outlet for connection of an external condensate pump, and status indicator lights to display the operational state of the unit shall be factory mounted on the rear panel of the casing.
- D. A single 115V to 24V step down transformer shall be provided for all unit controls.

2.26 Air Mover

- A. The motor horsepower shall be 1/8 H.P.
- B. The motor wiring shall be in flexible metal BX conduit.
- C. The motor shall be controlled by a time delay relay.
- D. Propeller models shall meet the following requirements:
- E. The motor type shall be Single-Speed, Totally Enclosed (TE).
- F. The air mover motor shall be a 115V motor.

2.27 Mounting

- A. The unit shall be equipped with tapped holes to accept 3/8"-16 threaded rod for suspension.

2.28 Accessories

- A. The following field installed accessory control devices shall be provided with the unit:
- B. A condensate drain kit consisting of one threaded PVC elbow and two specially designed condensate traps to allow the unit to operate and drain properly.

PART 3 -- EXECUTION

- 3.01 Install according to Modine printed instructions, and best trade practices.

END OF SECTION

DIVISION 26 – ELECTRICAL

Section 26 05 00 WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Work included.
- B. Temporary power and lighting.

1.02 RELATED SECTIONS

- A. Applicable provisions of Division 0 and Division 1 shall govern work under this section.
- B. All 26 00 00 electrical and 28 31 00 fire alarm sections.
- C. All other sections requiring electrical work.
- D. Coordinate work under provision of Division One - General Requirements.
- E. Temporary light and power Section of Division 1.
- F. Perform all trenching and backfilling required in connection with the work of this Section in strict accordance with the provisions of Division 2 of these Specifications.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.
- B. NECA "Standard of Installation."
- C. All state and local codes.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc as suitable for purpose specified and shown.
- C. Conform to all local codes.

1.05 WORK INCLUDED

- A. The mention of any article, operation or method requires that the Contractor shall provide same and work in complete accordance with the conditions stated. The contractor shall provide all material, labor, equipment, tools and transportation as needed to complete the project according to construction documents. Work includes all items to complete the electrical installation of all items indicated on the drawings, specified herein, and needed for a complete and operable facility but not specifically described in any other sections of this document. Among the items required are:
 - 1. Temporary power and lighting.
 - 2. Branch circuit panels for power and lighting.

3. Complete branch circuit wiring system for lighting, motors, unit heaters, water heater, welding stations, air compressor, fans, overhead door operator, receptacles, junction boxes and similar uses, and equipment & appliances noted on the Drawings.
 4. Wall switches, receptacles and similar items.
 5. Complete feeder system, in conduit, to power panels, large individual loads and branch circuit panels.
 6. Lighting fixtures.
 7. Systems:
 - a. Phone/Computer: Provide empty conduit and boxes at locations to be specified by RUSD. Provide and pull cable.
 - b. Fire alarm system as required.
 8. Necessary equipment as shown on plans.
 9. All items and appurtenances necessary, reasonably incidental or customarily included, even though each and every item is not specifically called out for or shown.
- B. All work shall be installed in accordance with all state and local inspection authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this contract.
- C. Before submitting his bid, each bidder shall examine the drawings relating to his work and shall become fully informed as to the extent and character of the work required and its relation to other work in the building.
- D. The contractor shall coordinate with the architect and establish exact locations of all materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment.
- E. Bids to include cost of all necessary permits and review fees.

1.06 QUALITY ASSURANCE AND WARRANTY

- A. Qualifications of installers: For the actual fabrication, installation and testing of the work of this section, use only thoroughly trained and experienced personnel who are completely familiar with the requirements for this work and with the installation recommendations of the Manufacturers of the specified items.
- B. Perform work to meet all codes.
- C. Contractor shall warranty all parts and labor, except lamps, for one year. All lamps will be working at time of substantial completion. The contractor will replace any lamps not working at time of substantial completion.

1.07 SUBMITTALS

- A. Within 14 days after award of contract, and before any of the materials of this section are delivered to the job site, submit eight complete sets to the Architect in accord with the provisions of Division One - General Requirements, the following:
1. Shop Drawing Submittals.
 2. Show variations from contract documents.
 3. The contractor shall not be relieved of responsibility for executing work in accord with contract documents, even though such drawings have been approved.
- B. Affidavits: The contractor shall execute the standard State Electrical Affidavit of Compliance with the Electrical Code and safe practices. Notarize and file two copies with the owner before final payment is made.
- C. Record Drawings: Day by day, as installed, details shall be transferred to a set of scale tracings prepared by the electrical contractor. The completed tracings shall be turned over to the Owner upon completion.

- D. Operation and Maintenance Data: The contractor shall provide two sets in loose leaf binders a compilation of catalog data of each manufactured item of equipment used in the electrical work and shall present this compilation to the Architect before final payment is made. Descriptive data and printed installation, operating and maintenance instructions and recommended spare parts list for each item of equipment shall be included.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Division One - General Requirements.
- B. All materials shall be suitably stored and protected prior to installation and all work, including equipment of other trades, shall be protected after installation, during construction and prior to acceptance.
- C. The contractor shall follow the manufacturer's directions completely in the delivery, storage and handling of equipment and materials. Equipment and materials shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment and materials shall be cleaned and polished thoroughly and shall be in a condition satisfactory to the architect.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.09 PROJECT CONDITIONS

- A. The Electrical Contractor shall visit the site of construction to familiarize himself with the site and existing conditions so as to become fully informed as to extent and character of the work and its relationship to work of other trades and existing facilities.
- B. Failure to provide for the cost of all contingencies in original bid will not be accepted as an excuse for extra payment.

1.10 ALTERNATIVES

- A. The work of this section is affected by alternatives as described on the drawings and in Section 01 03 00 of these specifications. All alternates must be approved before bids are submitted.
- B. The Electrical Contractor shall assume full responsibility for any alternate material or item proposed, regardless if it is approved or not. This responsibility will also include any and all costs of modifying feeders, branch circuits, ceilings, finishes, supports, structural, HVAC or any other incidental changes brought about by the alternate.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All equipment and materials shall be new, unless specifically noted otherwise and shall bear the Manufacturer's name, trademark and ASME, UL and/or other labels in every case where a standard has been established for the particular item. Equipment shall be the latest approved design of the standard product of a manufacturer regularly engaged in the production of the required type of equipment and shall be supported by a service organization that is, in the opinion of the architect reasonably convenient to the site.
- B. It is the responsibility of the Contractor to insure that items furnished fit the space available. He shall make field measurements to ascertain space requirements, including those connections, and shall furnish and install such sizes and shapes of equipment that, in the final installation, will suit the true intent and meaning of the Drawings and Specifications.

- C. The Contractor shall furnish and install all equipment accessories, connections and incidental items necessary to complete the work and operations.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection: Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify Conditions: Verify that all electrical installation may be made in complete accord with all pertinent codes, regulations, drawings and specifications.
- C. Discrepancies: In the event of discrepancy, notify the Architect and/or Engineer immediately for clarification. Do not proceed until discrepancies have been fully resolved.

3.02 PREPARATION

- A. Co-ordination of Work: The Contractor shall compare the electrical drawings and specifications with the drawings and specifications of other trades and report any discrepancies for changes necessary in the electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provisions to avoid interferences. Changes required in the work of the Contractor caused by neglect to do so, shall be made at the Contractor's own expense.
- B. Verification of Dimensions: The contractor shall visit the premises to verify all dimensions in the field; and shall advise the Architect and/or Engineer of any discrepancies before performing any work.

3.03 INSTALLATION

- A. It is the intent of this Specification that the Owner is presented with a complete, operable facility and the Electrical Contractor shall include ALL costs in the original bid.
- B. When the Architect has reviewed equipment submittals and given instructions to precede with the installation of items of equipment that require arrangements or connection different from those shown on the drawings, it shall be the responsibility of the contractor to install the equipment to operate properly and in accord with the intent of the drawings and specifications and shall provide any additional controllers, fittings or other equipment and materials that may be required. The contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional costs to other trades.
- C. The contractor shall support work and equipment plumb, rigid and true to line. The contractor shall study the general, structural, mechanical and electrical drawings, shop drawings and catalog data to determine how equipment, fixtures, conduit, etc. are to be installed and shall provide foundations, bolts, inserts, stands, hangers, brackets and accessories for proper support whether or not shown on the drawings.
- D. All materials and equipment shall be installed in accord with the approved recommendations of the manufacturer, the best practices of the trade, and in conformance with contract documents. Should the contractor perform any work that does not comply with the manufacturer's directions, the contractor shall bear all costs arising in correcting deficiencies.

E. Interferences:

1. Locations: Locations of conduit, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated or encountered. Devices specifically dimensioned on the drawings are critical dimensions and shall be installed as shown. The contractor shall determine the exact route and locations of each conduit prior to installation.
2. Right-of-way: Lines which pitch shall have right-of-way over those which do not pitch. For example, plumbing drains shall normally have right-of-way over lines whose elevations can be changed.
3. Offsets: Offsets and changes in direction in conduit shall be made as required to maintain proper head room and not interfere with pitch of sloping lines whether or not indicated on the drawings.

F. Location of lighting switches, outlets and equipment as shown on drawings is approximate and exact locations will be verified.

G. Minor modifications in location of switches, outlets and equipment is considered incidental up to a distance of 10 feet with no additional compensation, provided necessary instructions are given prior to rough in.

H. Work involving shutdown of present service and equipment now functioning in present area shall be done at such time as to provide the least amount of inconvenience to the owner at times established by the owner.

I. The Contractor shall verify the location and elevation of utilities and their relation to the work before beginning work.

J. Temporary electric service and lighting during construction:

1. Electrical contractor shall provide temporary light and power from existing building distribution as required.
2. Use existing panels, new panel(s) and/or furnish temporary panels complete with ground fault protection as required.
3. Each contractor shall provide their own extension cord for portable lamps and tools.
4. Each contractor will make their own service arrangements for heavy duty equipment and tools or other voltages.
5. Owner to pay for temporary electrical energy used on the existing service until the project is complete and turned over to the owner.
6. Provide at least one temporary light per room, hallway or stair. Maintain all lamps.
7. Electrical contractor shall be responsible for all aspects of the temporary power and light unless noted otherwise.
8. Remove temporary panels, circuits, lighting, receptacles and all associated equipment when it is no longer required.

K. Unless otherwise specified, job finish painting will be done by the painting contractor. Electrical equipment shall have a baked enamel finish. The electrical contractor shall restore damaged painted surfaces of electrical equipment to its original condition.

3.04 FIELD QUALITY CONTROL

A. Control circuits, branch circuits, feeders, motor circuits and transformers:

1. Megger check of phase-to-phase and phase-to-ground insulation levels. Do not megger check solid state equipment.
2. Continuity.
3. Short circuit.
4. Operational check.

B. Wiring devices: Test receptacles with Hubbell 5200, Woodhead 1750 or equal tester for correct polarity, proper ground connection and wiring faults.

3.05 CLEANING

- A. The electrical contractor shall daily remove crates, boxes, metal cuttings and debris from the building. At the end of the project, all electrically related debris shall be removed and the building shall be left in a clean condition.
- B. The electrical contractor shall leave all electrical equipment (interior and exterior), in a clean condition.

3.06 EQUIPMENT START-UP AND TESTING

- A. The contractor shall instruct the owner's operating personnel during start-up and separate operating test of each major item of equipment. During the operating test, the contractor shall prove the operation of each item of equipment to the satisfaction of the architect. At least two days' notice shall be given to the architect of equipment start-up and operating tests.
- B. Should any item of the system fail to perform in an approved manner, this test shall be repeated until the operating test is approved by the architect.
- C. Following the successful completion of operating tests by the Contractor, the owner shall have the privilege of making such tests as they may desire to ascertain in detail if any corrections are to be made to the system. At the end of the testing by the owner and architect, the architect shall direct the contractor in writing to make such corrections to the system as are within the scope of the contract.

END OF SECTION

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Building wire and cable.
- B. Underground feeder and branch circuit cable.
- C. Wiring connectors and connections.

1.02 RELATED SECTIONS

- A. Section 26 05 33.13 - Conduit.
- B. Section 26 05 33.16 - Boxes.
- C. Section 26 05 53 - Identification.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements. Provide upon request.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been stamped by the contractor.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 - National Electrical Code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to all local codes.

1.07 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.08 COORDINATION

- A. Coordinate Work under provisions of Division One - General Requirements.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS - BUILDING WIRE

- A. Carol.
- B. Triangle.
- C. Southwire.

2.02 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THW,RHW, TW, THHN/THWN, XHHW.
- E. Insulation: Material rated 75 degrees C minimum for branch circuits or feeders in wet and damp locations.
Material rated 90 degrees C for feeders in dry locations.

2.03 MANUFACTURERS – BUILDING MC CABLE

- A. Anixter Brothers, Inc.
- B. AFC Cable Systems, Inc.
- C. General Cable Company.
- D. Rome Cable Corp.
- E. Substitutions: Under provisions of Division One - General Requirements.

2.04 BUILDING CABLE: MC

- A. Description: Multi-conductor metal clad cable, polypropylene tape, galvanized steel armor. Lightweight steel metal-clad or steel metal clad cable on branch circuits. Steel metal clad fire alarm cable on fire alarm systems.
- B. Conductor: Copper. Where type MC cable carries multiple phase conductors, the cable shall include an oversized neutral conductor (150 to 200%) or one neutral conductor per phase for multi-phase systems.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THHN, material rated 90 degrees C minimum.

E. Grounding Conductors: An insulated grounding conductor, sized per code, shall be cabled with the circuit conductors and identified as a ground.

F. Type MC cable may only be used in concealed areas inside walls.

2.05 WIRING CONNECTORS

A. Split Bolt Connectors:

1. Burndy.
2. T&B.
3. Blackburn.
4. Panduit.

B. Solderless Pressure Connectors:

1. Burndy.
2. T&B.
3. Blackburn.
4. Panduit.

C. Spring Wire Connectors:

1. 3M.
2. Ideal.
3. T&B.
4. Blackburn.
5. Panduit.

D. Compression Connectors:

1. Burndy.
2. T&B.
3. Blackburn.
4. Blackburn.

PART 3 - EXECUTION

3.01 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.

3.02 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.03 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire Type THHN/THWN or type MC cable. MC cable may only be used for branch circuits or fire alarm circuits in concealed locations.

B. Exposed Dry Interior Locations: Use only building wire Type THHN/THWN, XHHW insulation, in raceway.

C. Wet or Damp Interior Locations: Use only building wire Type THHN/THWN, XHHW insulation, in raceway.

E. Exterior Locations: Use only building wire Type THHN/THWN, XHHW insulation, in raceway.

F. Underground Installations: Use only building wire Type THW, THHN/THWN, XHHW insulation, in raceway.

G. Use wiring methods indicated on Drawings.

3.04 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use solid or stranded conductors for feeders and branch circuits 10 AWG and smaller.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than 12 AWG for power and lighting circuits. Use oversized neutrals on electronic loads per code.
- E. Use conductor not smaller than 14 AWG for control circuits.
- F. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 50 feet. Size conductors for 3% voltage drop for circuits longer than 100 feet.
- G. Use 10 AWG conductors for 20 amperes, 277-volt branch circuits longer than 100 feet. size conductors for 3% voltage drop for circuits longer than 200 feet.
- H. Pull all conductors into raceway at same time.
- I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- J. Protect exposed cable from damage.
- K. Use suitable cable fittings and connectors.
- L. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- M. Clean conductor surfaces before installing lugs and connectors.
- N. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- P. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.
- Q. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- R. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- S. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.05 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.

3.06 FIELD QUALITY CONTROL

- A. Perform field inspection and testing.
- 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 all conductors.

END OF SECTION

Section 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.02 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.03 GROUNDING ELECTRODE SYSTEM

- A. Metal underground water pipe.
- B. Metal frame of the building.
- C. Concrete-encased electrode.
- D. Rod electrode.

1.04 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 25 ohms.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit upon project completion.
- B. Accurately record actual locations of grounding electrodes.
- C. Record overall resistance to ground.
- D. Contractor shall review and stamp all shop drawings prior to submitting them for review. The Architect will not review any submittals that have not been reviewed & stamped by the contractor.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum 3 years' experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 - National Electrical Code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc as suitable for purpose specified and shown.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 ROD ELECTRODE

A. Manufacturers:

1. Appleton.
2. Crouse-Hinds.
3. Burndy.

B. Material: Copper-clad steel.

C. Diameter: 3/4 inch .

D. Length: 10 feet.

2.02 MECHANICAL CONNECTORS

A. Manufacturers:

1. Appleton.
2. Crouse-Hinds.
3. Burndy.

B. Material: Bronze.

2.03 EXOTHERMIC CONNECTIONS

A. Manufacturer: Cad-Weld.

2.04 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: per drawing.

C. Grounding Electrode Conductor: Size to meet NFPA 70 or local requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 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 grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

D. Provide bonding to meet Regulatory Requirements.

E. Provide isolated grounding conductor for circuits supplying electronic equipment.

- F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- I. Ground each additional separate neutral to ground rods and water service.
- J. Use 4 AWG minimum copper conductor to ground communications service.
- K. Isolated ground: connect insulated ground conductor from service ground to device.

3.03 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall- of-potential method.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

1.02 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. ANSI/NFPA 70 - National Electrical Code.

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 - National Electrical Code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 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 precast insert system, expansion anchors and preset inserts.
 - 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 and preset inserts.
 - 6. Sheet Metal: Use sheet metal screws.
 - 7. Wood Elements: Use wood screws.

2.02 STEEL CHANNEL

- A. Manufacturer:
 - 1. UniStrut
 - 2. B-Line.
 - 3. Allied.
 - 4. Kindorf.
- B. Description: Galvanized (wet, damp locations) or painted steel (dry locations).

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- 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. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- H. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

Section 26 05 33.13 CONDUIT AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Fittings and conduit bodies.

1.02 RELATED SECTIONS

- A. General Requirements
- B. Section 26 05 33.16 - Boxes.
- C. Section 26 05 26 - Grounding and Bonding.
- D. Section 26 05 29 - Supporting Devices.
- E. Section 26 05 53 - Electrical Identification.

1.03 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NECA "Standard of Installation."
- F. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.04 DESIGN REQUIREMENTS

- A. Conduit Size: ANSI/NFPA 70.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of 26 05 00.
- B. Accurately record actual routing of conduits larger than 1" inches.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc as suitable for purpose specified and shown.

C. Conform to all local codes.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site under provisions of Division One -General Requirements.

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.

1.08 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 1/2 inch in interior, 3/4 inch exterior.

B. Underground Installations:

1. Site: Use rigid steel conduit, intermediate metal conduit or nonmetallic PVC conduit.

PVC conduit may only be used per local code.

2. In or Under Slab on Grade: Use rigid steel conduit, intermediate metal Conduit or thin-wall nonmetallic conduit.

3. Minimum Size: 3/4 inch.

4. PVC conduit may be used below grade per code, but not for elbows or stub ups. PVC conduit may be run up inside light pole or generator bases if allowed by local code.

C. Outdoor Locations, Above Grade: Use rigid steel conduit or intermediate metal conduit.

D. In Slab Above Grade:

1. Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing conduit.

2. Maximum Size Conduit in Slab: 1 inch. Maintain a minimum of 2" concrete covering. Run conduits within concrete parallel to each other and spaced on center at least three times the conduit trade size. Conduits over 1 inch may not be installed in slabs without approval of Architect.

E. Wet and Damp Locations: Use rigid steel, intermediate metal conduit or PVC (where not subject to damage) per code.

F. Dry Locations:

1. Concealed: Use electrical metallic tubing.

2. Exposed: Use electrical metallic tubing.

2.02 METAL CONDUIT

A. Manufacturers:

1. Republic Steel.
2. Allied.

B. Rigid Steel Conduit: ANSI C80.1.

C. Intermediate Metal Conduit (IMC): Rigid steel.

D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match body.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Electri-Flex.
2. Alfex Corp.

B. Description: Interlocked steel construction.

C. Fittings: ANSI/NEMA FB 1.

2.04 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Electri-Flex.
2. Alfex Corp.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Republic Steel.
2. Allied.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; set screw connectors and couplings may be used on interior EMT conduit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

E. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.

- F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. Route exposed conduit parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Do not cross conduits in slab.
- L. Maintain adequate clearance between conduit and piping.
- M. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- N. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- O. Bring conduit to shoulder of fittings; fasten securely.
- P. 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.
- Q. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- R. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2-inch size.
- S. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- T. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
- U. Provide suitable pull string 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. All conduit to be concealed, except in mechanical rooms. If accessible walls and ceilings are present in mechanical rooms, conduits and devices will also be concealed. Surface wiring to be used only where absolutely necessary.

3.02 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods as recommended by manufacturer and under the general Provisions. All conduits penetrating non-rated walls shall be caulked.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installer.

END OF SECTION

Section 26 05 33.16 BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.02 RELATED SECTIONS

- A. General Requirements - Division 7 - Roof Penetrations and Fire Stopping.
- B. General Requirements - Division 8.
- C. Section 26 27 26 - Wiring Devices: Wall plates.
- D. Section 28 31 00 - Fire Alarm and Smoke Detection Systems.

1.03 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements if requested.
- B. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been reviewed & stamped by the contractor.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 - National Electrical Code.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel, 4" square minimum.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.02 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 26.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
 - 1. Material: Galvanized cast iron, Cast aluminum.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify locations of floor boxes and outlets in offices, and work areas prior to rough-in.

3.02 INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights indicated and specified in section for outlet device.
- D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 5 feet if required to accommodate intended purpose.
- E. Maintain headroom and present neat mechanical appearance.
- F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- G. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods as required.
- H. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
 - I. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
 - J. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- L. Use flush mounting outlet box in finished areas.

- M. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- N. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- Q. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- S. Use adjustable steel channel fasteners for hung ceiling outlet box.
- T. Support boxes independently of conduit.
- U. Use gang box where more than one device is mounted together. Do not use sectional box.
- W. Use gang box with plaster ring for single device outlets.
- X. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Y. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- Z. Set floor boxes level.
- AA. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under Section 26 05 33.16.

3.04 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.

3.05 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Surface metal raceways.
- B. Multi-outlet assemblies.
- C. Wireways.
- D. Wall duct.

1.02 RELATED SECTIONS

- A. Section 26 27 26 - Wiring Devices: Receptacles.

1.03 REFERENCES

- A. NECA (National Electrical Contractors' Association) Standard of Installation.
- B. NEMA WD 6 - Wiring Device Configurations.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- B. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, finishes, and accessories.
- 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, and installation of Product.
- D. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been reviewed & stamped by the contractor.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of document on site.

1.06 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years' experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc as suitable for purpose specified and shown.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 SURFACE METAL RACEWAY

A. Manufacturers:

1. Wiremold V200, V500, V700, 4000 series as needed.
2. Hubbell.

B. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.

C. Size: As needed or shown on Drawings.

D. Finish: White or Ivory scuff coat.

E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

F. Run surface raceway in a neat and workman like manner. Surface raceway will only be allowed on existing walls where recessed devices cannot be cut in.

2.02 WIREWAY

A. Manufacturers:

1. Hoffmann.
2. Square D.
3. Wiegmann.

B. Description: General purpose type wireway.

C. Knockouts: Manufacturer's standard or none.

D. Size: As needed per NEC or as shown on Drawings.

E. Fittings: Lay-in type with removable top, bottom, and side; captive screws, drip shield for wet locations.

F. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

D. Wireway Supports: Provide steel channel as specified in Section 26 05 29.

E. Close ends of wireway and unused conduit openings.

F. Ground and bond raceway and wireway under provisions of Section 26 05 26.

G. Verify surface raceway routing in field. All surface raceway routing shall be approved by the architect. Installation shall follow molding or floor wherever possible. Vertical runs to be located at corners of walls or sides of columns wherever possible. Coordinate location with other trades.

END OF SECTION

Section 26 05 53 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

1.02 RELATED SECTIONS

- A. Section 09900 - Painting.

1.03 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- 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 and installation of Product.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 NAMEPLATES AND LABELS

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- B. Labels: Embossed adhesive tape, with black letters on white background in shop/mechanical areas or black letters on clear background in office areas.
- C. Locations:
 - 1. Each electrical distribution and control equipment enclosure.
 - 2. Communication cabinets.

D. Letter Size:

1. Use 1/8 or 1/4 inch letters for identifying individual equipment and loads.
2. Use 1/4 or 1/2 inch letters for identifying grouped equipment and loads.

2.02 WIRE MARKERS

A. Manufacturers:

1. Brady self-laminating type.

B. Description: self-laminating type wire markers.

C. Legend:

1. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings and/or shop drawings.

2.03 UNDERGROUND WARNING TAPE

A. Description: 4 inch wide (minimum) tape, colored yellow with suitable warning legend describing buried electrical lines; HTU6Y-E Model as manufactured by Panduit or equal.

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 APPLICATION

A. Install nameplate and/or label parallel to equipment lines.

B. Secure nameplate to equipment front using adhesive.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Identify underground conduits using underground warning tape. Install one tape per trench at 12 inches above conduit.

END OF SECTION

Section 26 05 83 WIRING CONNECTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Electrical connections to equipment specified under other sections.

1.02 RELATED SECTIONS

- A. Section 26 05 33.13 - Conduit.
- B. Section 26 05 19 - Building Wire and Cable.
- C. Section 26 05 33.16 - Boxes.

1.03 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. ANSI/NFPA 70 - National Electrical Code.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70 - National Electrical Code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to all local codes.

1.05 COORDINATION

- A. Coordinate work under all other sections.
- 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.

PART 2 - PRODUCTS

- A. All motors provided under other sections.
- B. (2) Ceiling Fans to be provided in future by RUSD and installed by others. Alternate Bid No. _____
 - 1. Verify & provide electrical circuit, wiring, conduit, junction boxes, and switch boxes for future installation.
 - 2. Fans shall be: Big Ass Ceiling Fans; Model: Essence;
each: 110-125 VAC, 1 ohm, 50/60 Hz; 10 amps

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify conditions.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices as indicated.
- G. Modify equipment control wiring with terminal block jumpers as indicated.
- H. Provide interconnecting conduit and wiring between devices and equipment where indicated.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Distribution panelboards.
- B. Branch circuit panelboards.

1.02 RELATED SECTIONS

- A. Section 26 05 29 - Supporting Devices.
- B. Section 26 05 53 - Electrical Identification: Engraved nameplates.

1.03 REFERENCES

- A. NECA (National Electrical Contractors Association) "Standard of Installation."
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- D. NEMA KS 1 - Enclosed Switches.
- E. NEMA PB 1 - Panelboards.
- F. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- G. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- 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. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been stamped by the contractor.

1.05 PROJECT RECORD DOCUMENTS

- A. Record actual locations of Products; indicate actual branch circuit arrangement.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division One - General Requirements.
- B. Maintenance Data: Include spare parts data listing; source of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of document on site.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum ten years' experience.

1.09 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 (National Electrical Code).
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings and as instructed by manufacturer.

1.11 MAINTENANCE MATERIALS

- A. Provide maintenance materials under provisions of Division One - General Requirements.
- B. Provide two of each panelboard key.

1.12 EXTRA MATERIALS

- A. Furnish under provisions of Division One - General Requirements.
- B. Provide all accessories as needed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General Electric.
- B. Square D.
- C. Cutler-Hammer.
- D. Siemens/ITE.
- E. Above manufacturers to provide equipment equal to that shown on drawings.

2.02 DISTRIBUTION PANELBOARDS

- A. Panelboards: NEMA PB 1, circuit breaker type.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Molded Case Circuit Breakers: NEMA AB 1. Provide bolt-on 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 bolt-on 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 bolt on circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically re-setting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- G. Provide circuit breaker accessory trip units and auxiliary switches as indicated.
- H. Enclosure: NEMA PB 1, Type 1(indoor/dry) Type 3R (outdoor/wet/damp).
- I. Cabinet Front: Recessed or surface type. Provide hinged door with flush lock. Finish in manufacturer's standard gray enamel.

2.03 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated.
- D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- E. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide bolt-on circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.
- F. Enclosure: NEMA PB 1, Type 1 (indoor/dry), Type 3R (outdoor/wet/damp).
- G. Cabinet box: 6 inches deep, 20 inches wide.
- H. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports in accordance with Section 26 05 29.
- C. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.
- D. Provide filler plates for unused spaces in panelboards.

- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling or below floor. Minimum spare conduits: 5 empty 1 inch . Identify each as SPARE.

3.02 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under Division One - General Requirements.
- 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

Section 26 27 16 ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Terminal blocks.
- C. Accessories.

1.02 RELATED SECTIONS

- A. Section 26 05 29 - Supporting Devices.

1.03 REFERENCES

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems.
- C. ANSI/NFPA 70 - National Electrical Code.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Hoffman.
- B. Saginaw.

2.02 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 1, 3R, 4, 4x steel enclosure as required for application.
- B. Covers: Continuous hinge, held closed by flush latch operable by screwdriver. Outdoor enclosures to have hasp and staple for padlock.
- C. Provide interior metal panel for mounting terminal blocks and electrical components; finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

2.03 TERMINAL BLOCKS

A. Manufacturers:

1. Allen-Bradley.
2. Cutler-Hammer.
3. General Electric.
4. Square D.

B. Terminal Blocks: ANSI/NEMA ICS 4.

C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.

D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.

E. Provide ground bus terminal block, with each connector bonded to enclosure. Ground enclosure door.

2.04 ACCESSORIES

A. Plastic Raceway:

1. Hoffman.
2. Panduit.
3. Tyton.
4. Description: Slotted, light gray with cover.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordinate installation with other trades.
- B. Verify that surfaces are ready to receive Work.

3.02 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner.

END OF SECTION

Section 26 27 26-1 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Device plates and decorative box covers.

1.02 RELATED SECTIONS

- A. Section 26 05 33.16 - Boxes.

1.03 REFERENCES

- A. NECA - Standard of Installation.
- B. NEMA WD 1 - General Requirements for Wiring Devices.
- C. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- D. NFPA 70 - National Electrical Code.

1.04 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Division One - General Requirements.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been stamped by the contractor.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum three years' experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 WALL SWITCHES

A. Single Pole Switch:

1. Leviton: CSB1-20 20 Amp commercial specification grade.
2. Hubbell: 20 Amp commercial specification grade equal to Leviton.
3. Cooper: 20 Amp commercial specification grade equal to Leviton.

B. Double Pole Switch:

1. Leviton: CSB2-20 20 Amp commercial specification grade.
2. Hubbell: 20 Amp commercial specification grade equal to Leviton.
3. Cooper: 20 Amp commercial specification grade equal to Leviton.

C. Three-way Switch:

1. Leviton: CSB3-20 20 Amp commercial specification grade.
2. Hubbell: 20 Amp commercial specification grade equal to Leviton.
3. Cooper: 20 Amp commercial specification grade equal to Leviton.

D. Four-way Switch:

1. Leviton: CSB4-20 20 Amp commercial specification grade.
2. Hubbell: 20 Amp commercial specification grade equal to Leviton.
3. Cooper: 20 Amp commercial specification grade equal to Leviton.

E. Indicator Switch:

1. Leviton: 1221PL, 1222PL, 1223PL 20 Amp industrial specification grade.
2. Hubbell: 20 Amp industrial specification grade equal to Leviton.
3. Cooper: 20 Amp industrial specification grade equal to Leviton.

F. Locator Switch:

1. Leviton: 1221LH, 1223LH 20 Amp industrial specification grade.
2. Hubbell: 20 Amp industrial specification grade equal to Leviton.
3. Cooper: 20 Amp industrial specification grade equal to Leviton.

G. Substitutions: under provisions of Division One - General Requirements.

H. Color: Per architect and owner.

2.02 RECEPTACLES

A. Duplex Convenience Receptacle:

1. Leviton: BR20 20 Amp commercial specification grade.
2. Hubbell: 20 Amp smooth face tamper resistant commercial specification grade equal to Leviton.
3. Cooper: 20 Amp smooth face tamper resistant commercial specification grade equal to Leviton.

B. GFCI Receptacle:

1. Leviton: 7899 series Smart lock pro 20 Amp GFCI.
2. Hubbell: Equal to Leviton.
3. Cooper: Equal to Leviton.
4. Weather resistant in damp or wet locations.

C. Isolated Ground Receptacle:

1. Hubbell: IG5362 20 Amp smooth face industrial specification grade.
2. Leviton: 5362IG 20 Amp smooth face industrial specification grade.
3. Cooper: IG5361 20 Amp smooth face industrial specification grade.

E. Color: Per Architect and owner. Receptacles on emergency power shall be red.

2.04 WALL PLATES

A. Decorative Cover Plate: Smooth nylon.

1. Leviton: 80700 series.
2. Hubbell: Equal to Leviton.
3. Cooper: Equal to Leviton.

B. Weatherproof Cover Plate: Gasketed aluminum with hinged gasketed in-use aluminum device cover.

1. Red Dot: CKMG series wet location in-use receptacle cover or equal.
2. Red Dot: CCT series raintight switch cover or equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Division 1 - Coordination and Meetings: Verification of existing conditions prior to beginning work.
- B. Verify that outlet boxes are installed at proper height.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that floor boxes are adjusted properly.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that openings in access floor are in proper locations.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.03 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- E. Do not share neutral conductor on load side of dimmers.
- F. Install receptacles with grounding pole on bottom.
- G. Connect wiring device grounding terminal to outlet box with bonding jumper or branch circuit equipment grounding conductor.
- H. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- I. Connect wiring devices by wrapping conductor around screw terminal.
- J. Use jumbo size plates for outlets installed in masonry walls.

K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas and on surface mounted outlets.

L. Install protective rings on active flush cover service fittings.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 to obtain mounting heights where specified / directed by Architect or/and indicated on drawings.

B. Install top of wall switch box 48 inches above finished floor.

C. Install bottom of convenience receptacle box 18 inches above finished floor.

D. Install bottom of convenience receptacle box 6 inches above counter or backsplash of counter.

E. Install top of box dimmer 48 inches above finished floor.

F. Install bottom of telephone jack box 18 inches above finished floor.

G. Install top of telephone jack box for side-reach wall telephone to position top of telephone at 54 inches above finished floor.

H. Install top of telephone jack box for forward-reach wall telephone to position top of telephone at 48 above finished floor.

3.05 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.

F. Verify that each telephone jack is properly connected and circuit is operational.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fuses for switchboards, distribution equipment, motor control centers, combination starters, transformer protection and disconnect switches.

1.02 RELATED SECTIONS

- A. Section 16 44 10.

1.03 REFERENCES

- A. NFPA 70 - National Electric Code.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 (National Electrical Code).
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.
- C. Conform to all local codes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann.
- B. Gould Shawmut.
- C. Littelfuse.

2.02 FUSE REQUIREMENTS

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Main Service Switches Larger than 600 amperes: Class L current limiting time delay.
- D. Main Service Switches: Class RK1 time delay.
- E. Motor Load Feeder Switches: Class RK1 time delay.
- F. Lighting Load Feeder Switches: Class RK1 time delay.
- G. Motor Branch Circuits: Class RK1 time delay.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install fuse with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fusible switches.
- B. Non-fusible switches.
- C. Fuses.

1.02 REFERENCES

- A. NEMA KS 1 - Enclosed Switches.
- B. NFPA 70 - National Electrical Code.
- C. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
- D. UL 198E - Class R Fuses.

1.03 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- 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.
- D. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals not stamped by the contractor.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with NECA Standard of Installation.
- B. Maintain one copy of each document on site.

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum ten years' experience.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by UL as suitable for purpose specified and shown.
- C. Conform to all local codes.

1.07 EXTRA MATERIALS

- A. Furnish under provisions of Division One - General Requirements.
- B. Provide three of each size and type fuse installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. General Electric.
- B. Square D.
- C. Cutler-Hammer.
- D. Siemens/ITE.
- E. Above manufacturers to provide equipment equal to that shown on drawings.

2.02 ENCLOSED SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1, Type HD 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. Non-fusible Switch Assemblies: NEMA KS 1, Type HD 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.
 - 3. Wash down Locations: Type 4,4X.

2.03 FUSES

- A. Manufacturers:
 - 1. Bussmann
 - 2. Gould Shawmut.
 - 3. Littelfuse.
- B. Description: Dual element, current limiting, time delay, one-time fuse, 250, 600 volt, UL 198E, Class RK 1.
- C. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.01 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.

END OF SECTION

Section 26 05 26 INTERIOR LIGHTING, FANS, & ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires and accessories.
- B. Emergency lighting units.
- C. Exit signs.
- D. Luminaire accessories.
- E. Retractable Cord Reels

1.02 RELATED SECTIONS

- A. Section 26 05 33.16 - Boxes.

1.03 REFERENCES

- A. ANSI C78.379 - Electric Lamps - Incandescent and High- Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
- B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
- C. ANSI/NFPA 70 - National Electrical Code.
- E. ANSI/NFPA 101 - Life Safety Code.
- F. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.04 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- 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.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, Examination, preparation, and installation of product.
- F. Contractor shall review and stamp all shop drawings prior to submitting them for review. Architect will not review any submittals that have not been reviewed & stamped by the contractor.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division One - General Requirements.
- B. Maintenance Data: Include replacement parts list.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years' experience.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70 (National Electrical Code).

B. Conform to requirements of NFPA 101 .

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

D. Conform to all local codes.

PART 2 - PRODUCTS

2.01 LUMINAIRES

A. Furnish products as specified in schedule on Drawings.

- | | | |
|----|---|---------------|
| 1. | Area Lighting Fixtures
Lithonia Lighting IBC LED High Bay fixtures
IBH 2 ft 15,000 LM
SEF WD AFL 4,000 k, 70 CRI, 14,686 LUMENS, 95.25 WATTS | (12) Required |
| 2. | Exterior Security Lighting Fixtures
E-Conolight E-WP10 Wall Pack | (3) Required |

B. Install lamps and specified accessories at factory.

2.02 EXIT SIGNS & EMERGENCY LIGHTING UNITS

A. Furnish products as specified in schedule on Drawings.

- | | | |
|----|---|--------------|
| 1. | Exit Signs / Egress Lighting fixtures
Lithonia Lighting LHQM LED Exit Unit Combo | (2) Required |
|----|---|--------------|

2.03 LAMPS

A. Manufacturers:

1. General Electric.
2. Phillips.
3. Sylvania.

2.04 LIGHTING CONTROL PANELS

A. Lighting control panel: Lighting control panel and override switches provided and programmed and installed by electrical contractor.

2.08 CORD REELS

- A. Provide Drop-Down Cord Reels (7) Required
1. Model SL-8906 as manufactured by Bayco Products, Inc.
www.baycoproducts.com Lighting LHQM LED Exit Light
50' 12/3 SJEOW cord with 4 outlet plug
Each with 15 amp integral circuit breaker.
 2. Verify locations with RUSD Representative on-site after new building is Enclosed.

2.09 FANS

- A. Ceiling Fans – future, by RUSD: (2) Required
1. Provide wiring, but no installation, for (2) Big Ass Ceiling Fans
Each: 110-125 VAC, 1 ohm, 50/60 Hz. 10 amps
 2. Verify & provide electrical circuit, wiring, conduit, junction boxes, and switch boxes for future installation.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrate and supporting grids for luminaires.
- B. Examine each luminaire to determine suitability for lamps specified.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install suspended luminaires and exit signs using pendants supported from swivel hangers or chain provided by fixture manufacturer. Provide pendant length required to suspend luminaire at height specified by Architect.
- C. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- F. Install wall mounted luminaires , emergency lighting units and exit signs at height specified by Architect.
- G. Install accessories furnished with each luminaire.
- H. Connect luminaires , emergency lighting units and exit signs to branch circuit outlets provided under Section 26 05 33.16 using flexible conduit as indicated.
- I. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- J. Bond products and metal accessories to branch circuit equipment grounding conductor.
- K. Install specified lamps in each luminaire , emergency lighting unit and exit sign.

3.03 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.04 ADJUSTING

- A. Adjust Work under provisions of Division One -General Requirements.
- B. Aim and adjust luminaires as required.
- C. Adjust exit sign directional arrows as indicated.
- D. Re-lamp luminaires that have failed lamps at Substantial Completion.

3.05 CLEANING

- A. Clean Work under provisions of Division One - General Requirements.
- 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.

END OF SECTION

DIVISION 27 - COMMUNICATIONS

SECTION 27 00 00 COMMUNICATIONS

Part I: General

- 1.01 A COPY OF THESE SPECIFICATIONS IS REQUIRED TO BE ON EVERY JOB SITE TABLE OF CONTENTS Section I General Standards (EIA/TIA 568B.2.1 Standard for category 6) Specifications for Inside and Outside Plant Wiring Practices:
- 1.02 Included within Section
 - A. Contractor Requirements
 - B. Standards for Quality, Craftsmanship, and Completeness
 - C. Code Compliance
- 1.03 Included within Section II - Specifications
 - A. Information Outlets (Voice/Data Jacks)
 - B. Information Outlet for Wall Mounted Height
 - C. Labeling
- 1.04 Included within Section III - Testing
 - A. Information outlet Cabling
 - B. Levels of certification
- 1.05 Section IV - Certification/Acceptance
- 1.06 Section V - Warranty
- 1.07 All cabling, jacks, cover plates and termination according to TIA/EIA 568B.21 Standards and wiring to be terminated to 568B Standard. Cables provided and pulled by electrical contractor.
- 1.08 Data cables shall be terminated in panel to be directed by RUSD.
- 1.09 "AS BUILTS" are required. Provide to RUSD Representative at conclusion of construction.
- 1.10 The color scheme for all riser cable labeling designation strips is "BLUE", and the color scheme for voice station cable labeling designation strips is "RED".
- 1.11 Verify and match products and components of existing systems.

1.12 CONTRACTOR REQUIREMENTS and Qualifications

- A. Final qualification to determine a successful contractor (Electrical Contractor or Communications Contractor subcontracted by Electrical Contractor) will be made by Racine Unified School District Representative.
- B. There will be a prequalifying procedure. This procedure will involve checking and verifying references. Contractor shall submit for approval, before work begins, three (3) references of work of a similar type and scale. References must contain names and Telephone numbers of contact personnel. Contractor shall also submit names of technicians that will perform work specified herein, with documentation of schools and coursework (with Dates) indicating proficiency with the installation of data cable and fiber optic cable. The RUSD Representative; prior to the issuance of any purchase order or work authorization shall approve this submittal. The contractor installing the telecommunications facilities and equipment herein specified shall be an experienced TELECOMMUNICATIONS CONTRACTOR. Experienced “meaning that the contractor has been in this type of business for a minimum of three (3) years and have personnel that have been trained and certified in the installation of this type of telecommunications facilities products and systems. Additionally, the Contractor will have successfully completed installation of similar equipment and size to that specified herein within the last year of Project.
- C. Contractors must have a BICSI Registered/Certified Communications Distribution Designer (RCDD) on staff. and furnish copy of current registration with submittal. Supervisor or Lead Tech on every project must have current Registered BICSI RCDD and/or Registered BICSI Technician Certification.
- D. License and Codes: The successful Contractor must have applicable licenses (including but not necessarily limited to low voltage) and follow municipal codes for the areas in which projects are accomplished, to include NFPA, NEC, TIA/EIA/ANSI and BICSI.

- 1.13 Safety Procedures: HARD HATS and all other appropriate safety equipment shall be worn during all construction procedures. The vendor shall furnish appropriate safety equipment for their employees and construction site, to include safety zoning and the securing of all equipment and tools at all times. Must have first aid and safety training certificate provided to the RUSD Representative prior to commencing work.
- 1.14 Damages: Any and all damages to property done by a Contractor will be the responsibility and liability of the Contractor. The RUSD Representative will designate all Telecommunications qualified contractors as “ONLY” are to be used.
- 1.15 Work Rules: Contractor’s employees must keep in mind during all contacts with client personnel that client satisfaction is paramount. Contractor’s employees’ speech, actions, dress and attitude must not detract from client satisfaction at any time. Contractor employees must keep in mind, however, that they are representing the RUSD and in such contacts, avoid actions or speech that would reflect unfavorably on the District. Contractor must commit to maintaining high standards of professional conduct, neat and clean appearance of vehicles, equipment and personnel, and honest business practices are required. Parties agree that lackadaisical attitude of personnel, unwashed or battered vehicles, and misstatements on reports or invoices, and delayed payment of bills relating to such contracts are examples of unacceptable behavior. RUSD requires all contractor personnel to dress appropriately for the task at hand. RUSD requires all technicians who perform fieldwork to drive a contractor provided vehicle, which is clearly marked as belonging to the contractor. The vehicles can be any type preferred by the contractor as long as the vehicles are clearly marked, in good operating order, and have a good appearance. RUSD shall retain the right to request the removal of any of the contractor’s personnel at any time.
- 1.16 QUALITY, CRAFTSMANSHIP, AND COMPLETENESS: It is expected that the work completed under these specifications will be on the highest professional quality and craftsmanship. All systems furnished herein shall be complete and in compliance with manufacturer’s recommendations and designs. Contractor shall supply all components of the specified system as recommended by the manufacturer, whether specifically designated in these specifications or not.

- 1.17 CODE COMPLIANCE: The Contractor is responsible for compliance with all Federal State and Local codes that are applicable to electrical and telecommunications wiring and fire codes. If there is any conflict between these specifications and codes, the stringent requirement shall apply.

PART II - Specifications

- 2.01 INFORMATION OUTLETS (VOICE/DATA JACKS) For each information outlet location designated, owner to provide a Standard 2 port Category 6 data jack colored ORANGE mounted in an ivory triplex outlet cover. Terminations shall be in conformance with EIA/TIA 568B.2 by owner. Use Category 6A Systimax Jacks. Electrical outlets, jacks and receptacles, with (ivory color) faceplates matching the electrical outlet shall be and installed at the height to be designated by the Architect.
- 2.02 All information outlets shall be marked at the point of manufacture with engraved letters indicating that the top jack is voice and the bottom jacks are data. For horizontally mounted information outlets, the left jack shall be voice and the right jacks are data. Conduits provided for outlets must have protective caps on end of conduit. The minimum requirement for all information outlets is 3/4 inch EMT conduit unless noted otherwise. The minimum requirement for all media screen outlets is 1 inch EMT unless noted otherwise.
- 2.03 Each information outlet and its associated termination shall be labeled according to the following scheme:
- A. FLOOR NUMBER THE JACK NUMBER. The information outlet shall be marked on the top right bevel of the faceplate. A black, letter Label is Mandatory for this purpose. Lettering shall be block letters and numerals
 - B. INFORMATION OUTLET FOR WALL MOUNTED HEIGHT All locations designated for hanging wall jacks shall be fitted with the information outlet as described in "INFORMATION OUTLET." The outlet boxes shall be mounted 42 inches above the finished floor, unless otherwise directed by the Architect.
 - C. LABELING All twisted pair terminations shall be marked with the jack number.

PART III - Testing

- 3.01 INFORMATION OUTLET CABLING Owner shall certify all station wire as to fext (far end cross talk) and other appropriate Category 6A tests. Using a Results of said test will be submitted to RUSD MIS Department for building records,
- 3.02 Owner shall keep a record of all tests made indicating length, wire map, attenuation, NEXT, DC loop resistance, and return loss.
- 3.03 Levels of Cable Testing and Certification/Acceptance: Inspect and test company with RUSD MIS Department Representative.

PART IV - Warranty

- 4.01 All cable (not including terminations and components) of this cabling specification shall be warranted by the Installing Contractor to perform as new for a period of three (3) years from date of system acceptance.

END OF SECTION

DIVISION 28 – ELECTRONIC SAFETY & SECURITY

Section 28 31 00 FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm control panels.
- B. Manual fire alarm stations.
- C. Automatic smoke and heat detectors.
- D. Fire alarm signaling appliances.
- E. Auxiliary fire alarm equipment.

1.02 RELATED SECTIONS

- A. Section 16 12 30 - Building Wire and Cable.

1.03 REFERENCES

- A. NFPA 70 - National Electrical Code.
- B. NFPA 72 - Installation, Maintenance, and Use of Protective Signaling Systems.
- C. NFPA 72E - Automatic Fire Detectors.
- D. NFPA 72G - Notification Appliances for Protective Signaling Systems.
- E. NFPA 72H - Guide for Test Procedures for Protective Signaling Systems.
- F. NFPA 101 - Life Safety Code.
- G. International Fire Alarm Code.
- H. International Building Code - IBC

1.04 REGULATORY REQUIREMENTS

- A. UL and FM approved.
- B. Conform to NFPA 72A, NFPA 72B, NFPA 72C, NFPA 72E, NFPA 72G, and NFPA 72H, NFPA 101.
- C. Conform to NFPA 70 - National Electrical Code.
- D. Conform to ADA (Americans with Disabilities Act).
- E. Conform to International Fire Alarm Code.
- F. Conform to International Building Code.
- G. Conform to all local codes. Include all permits and any review fees.

1.05 SYSTEM DESCRIPTION

- A. Fire Alarm System: NFPA 72, verify, modify, and expand existing building system as needed and as required for Code compliance.

1.06 SUBMITTALS

- A. Submit under provisions of Division One - General Requirements.
- B. Shop Drawings: Provide riser drawing, battery calculations and equipment cut sheets.
- C. Product Data: Provide electrical characteristics and connection requirements.
- D. Test Reports: Indicate satisfactory completion of required tests and inspections.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

1.07 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division One - General Requirements.
- B. Record actual locations of all fire alarm devices.

1.08 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division One - General Requirements.
- B. Operation Data: Operating instructions.
- C. Maintenance Data: Maintenance and repair procedures.

1.09 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years' experience.
- B. Installer: Company specializing in installing the products specified in this section with minimum three years' experience.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance of fire alarm system for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Field Verify, match, and extend existing with products & components by same manufacturer.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Provide Control Sub-Panel within the new building; connect new system to existing building system. Include all devices, circuit boards, programming and all other equipment as required to expand existing system.

- B. Power supply: Adequate to serve control panel modules, remote detectors, remote annunciators, door holders, smoke dampers, relays, and alarm signaling devices. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 10 minutes. Verify battery calculations. Increase power supply if required.
 - C. System Supervision: Component or power supply failure places system in trouble mode.
 - D. Initiating Device Circuits: Existing addressable initiation circuit with alarm and trouble indication; occurrence of single ground or open condition places circuit in trouble mode but does not disable that circuit from initiating an alarm. Connect new and reused devices to existing addressable circuit or provide a new addressable circuit if/as required.
 - E. Indicating Appliance Circuits: Add new audio/visual devices to existing third floor NAC panel. Audible and visible devices may be on the same circuit, but shall be controlled separately thru smart sync control modules or equal. Supervised signal module, sufficient for signal devices connected to system; occurrence of single ground or open condition places circuit in trouble mode but does not disable that circuit from signaling an alarm.
 - F. Match any existing digital communicators
 - G. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts to provide accessory functions specified.
 - H. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.
 - I. Trouble Sequence of Operation: System or circuit trouble places system in trouble mode, which causes the following system operations:
 1. Visual and audible trouble alarm indicated by zone at fire alarm control panel.
 2. Visual and audible trouble alarm indicated at remote annunciator panel.
 3. Trouble signal transmitted to municipal or monitoring connection.
 4. Manual acknowledge function at fire alarm control panel silences audible trouble alarm; visual alarm is displayed until initiating failure or circuit trouble is cleared.
 - J. Alarm Sequence of Operation: Actuation of initiating device places circuit in alarm mode, which causes the following system operations:
 1. Sound horns with temporal signal. Strobes turn on (synchronized).
 2. Transmit signal to municipal or monitoring connection.
 3. Indicate location of alarm device on fire alarm control panel and on remote annunciator panel.
 4. Transmit signals to building control panel.
 5. Transmit signal to new building mechanical systems to initiate shutdown of fans and damper operation.
 - K. Alarm Reset: System remains in alarm mode until manually reset with key-accessible reset function; system resets only if initiating circuits are out of alarm mode.
 - L. Lamp Test: Manual lamp test function causes alarm indication at each zone at fire alarm control panel and at annunciator panel.
 - M. Drill Sequence of Operation: Manual drill function causes alarm mode operation as described above.
- 2.03 INITIATING DEVICES
- A. Supervised individual addressable module: Module to match or be compatible with existing system to monitor tamper switches, flow switches and other dry contact devices as needed.

- B. Ceiling Mounted Smoke Detector: Smoke detector to match or be compatible with existing system. NFPA 72E, photoelectric type with adjustable sensitivity, plug-in base, visual indication for power on and detector actuation, suitable for mounting on 4-inch outlet box.

2.04 SIGNALING APPLIANCES

- A. Horn/Strobe: Horn/strobes and/or strobes to match or be compatible with existing system. NFPA 72G, surface or flush type, wall or ceiling mount, synchronized horn/strobe with red housing. Sound rating: 92dB at 10 feet (coded) minimum.

2.05 AUXILIARY DEVICES

- A. Zone Adapter Module: Simplex module to match or be compatible with existing system. Provide interface relay if needed.

2.06 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16123 per local codes.
- B. Initiating Device and Indicating Appliance Circuits: Building wire as specified in Section 16123 per local code.
- C. Fire alarm wiring may be conductors or cable run inside conduit and/or steel Type MC cable used per code. Conduit will be used at all exposed locations.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install manual station with operating handle no more than 48 inches above finished floor.
- C. Install strobes and horn/strobes 80 inches above finished floor.
- D. Use cable as recommended by manufacturer for fire alarm detection and signal circuit conductors. Install wiring/cable in conduit.
- E. Mount outlet box for electric door holder to withstand 80 pounds pulling force.
- F. Make conduit and wiring connections to duct smoke detectors and hood suppression systems.
- G. Automatic Detector Installation: Conform to NFPA 72E.
- H. Paint 120V fire alarm circuit breakers fronts red.

3.02 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division One - General Requirements.
- B. Test in accordance with NFPA 72H and local fire department requirement.

3.03 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division One - General Requirements.
- B. Include services of certified technician to supervise installation, adjustments, final connections, programming and system testing.

3.04 FIRE ALARM WIRE AND CABLE COLOR CODE

A. Provide fire alarm circuit conductors with insulation color per code.

3.05 DEMONSTRATION

A. Provide systems demonstration under provisions of Division One – General Requirements.

B. Demonstrate normal and abnormal modes of operation, and required responses to each.

END OF SECTION

DIVISION 31 EARTHWORK

Section 31 20 00 Earth Moving

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Building excavation.
- B. Shoring excavations.
- C. Building perimeter backfilling to sub grade elevations.
- D. Site backfilling.
- E. Fill under slabs-on-grade.
- F. Compaction requirements.
- G. Excavate trenches for utilities to municipal utilities.
- H. Compacted bed and compacted fill over utilities.

1.02 PROJECT

- A. Submit documents in accordance with Section 01340 - SUBMITTALS.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

1.03 PROTECTION

- A. Protect trees, shrubs, lawns, rock outcroppings, and other features remaining as portion of final landscaping.
- B. Protect benchmarks, existing structures, fences, roads, sidewalks, paving and curbs from equipment and vehicular traffic.
- C. Protect above or below grade utilities which are to remain.
- D. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer at no additional cost to the Owner.
- E. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in shoring prior to backfilling.
- F. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- G. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

- I. Grade excavation top perimeter to prevent surface water run-off into excavation.
- J. Maintain designated site access for vehicle and pedestrian traffic.

1.04 DUST CONTROL

- A. Use all means necessary to control dust on near the work and on and near all off-site borrow areas if such dust is caused by the Contractor's operations during performance of the work or if resulting from the conditions in which the Contractor leaves the site.
- B. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on-the site.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for disposal of debris.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Graded free of roots, rocks larger than one inch, subsoil, debris, and large weeds.
- B. Use approved granular borrow soil materials from site.
- C. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
Maximum passing 200 sieve content of 15%.
- D. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2.02 SELECT BED AND FILL MATERIALS

- A. "General fill" for filling and backfilling all areas outside of the building lines (except under paved areas) may be broken stone, sand, bank run gravel, earth, or approved material from excavation. All such fill shall be free from peat, wood, large stones or boulders, roots, cinders, trash, or other similar objectionable material with maximum size of rocks or lumps not more than 6 inches.
- B. "Structural fill" for fill under footings, structures, paved areas to below base course, and inside building up to 6" beneath the underside of floor slabs, shall be a coarse grained cohesionless soil with less than 8% passing the No. 200 sieve. The material shall be free of peat, loam, rocks or lumps not more than 1 - 1/2".

- C. "Drainage fill" for use as a "base course" under interior floor slabs and exterior walks, steps, etc., shall be as shown or 6" minimum, thick bed of compacted granular free draining fill material consisting of clean bank run gravel, sand or crushed stone of full range of sizes. Maximum clay content not to exceed 5%. Maximum size of aggregate to be 3/4".
- D. Trench backfill:
 - 1. On-site fill materials: All on-site fill material used for trench and structural backfill Shall- meet the requirements of Article B above.
 - 2. Imported cohesionless material: All imported cohesionless material used for trench and structural backfill shall be free from organic substance and other deleterious matter, shall be subject to the approval of the Architect, and shall meet the requirements of B above.
- E. All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to the approval of the Architect.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify foundation perimeter drainage installation has been inspected.
- C. Verify foundation walls are braced to support surcharge forces imposed by backfilling operation.
- D. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.
- E. Backfilling prior to approvals:
 - 1. Do not allow or cause any work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests, and approvals.
 - 2. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner.
 - 3. After the work has been completely tested, inspected, and approved, 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.

3.02 CLEARING AND REMOVAL

- A. Upon completion of the work of this Section, immediately remove all debris and excess earth-materials from the site.

3.03 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Identify and flag above utilities.
- D. Maintain and protect existing utilities remaining which pass through work area.
- E. Notify utility company to remove and relocate utilities.
- F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Architect.

- G. When necessary, compact sub grade surfaces to density requirements for backfill material.
- H. Cut out soft areas of sub-grade not readily capable of compaction. Backfill and compact to density equal to requirements for subsequent backfill material.
- I. Provide berms to channels to prevent flooding of sub grade; promptly remove water collecting in depressions.
- J. Sub grade preparation:
 - 1. Proof roll disturbed brown silty sandy gravel soil within the building and below paved areas with a minimum of 3 passes, using a heavy self-propelled vibratory type compactor with a minimum weight of ten tons. Proof roll prior to placing any fill.
 - 2. Leveling: Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.

3.04 EXCAVATION

- A. Excavate subsoil required for building foundations, construction operations, and other work.
- B. Excavation shall not interfere with normal 45 degree bearing splay of any foundation.
- C. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.
- D. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.
- E. Remove lumped subsoil, boulders, and rock.
- F. Correct unauthorized excavation at no cost to Owner.
- G. Stockpile excavated material in area designated on site and remove excess sub-soil not being reused, from site.
- H. Depressions resulting from removal of obstructions: Where depressions result from, or have resulted from, the removal of surface or subsurface obstructions, open the depression to equipment working width and remove all debris and soft material as directed by the Architect.
- I. Remove existing fill and topsoil within the building and below paved areas down to the silty sandy gravel soils. Deposit excavated material on site as directed.
- J. Further excavate to elevations and dimensions shown on the drawings for Foundations.
- K. Over-excavation: Backfill and compact all over-excavated areas as specified for fill below and at no additional cost to the Owner.
- L. Frost Protection: Protect bottom of excavation from frost. Do not backfill or place foundations, footing, or slabs on frozen ground.
- M. Excess excavation: Excavated material in excess of that required for backfill around the building shall be wasted off-site by the Contractor. Additional material required for grading and the Contractor as required will furnish backfilling.

3.05 BACKFILLING, FILLING AND COMPACTION

- A. Backfill areas to contours and elevations. Use unfrozen materials.

- B. Backfill trenches to contours and elevations. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy sub grade surfaces.
- C. Employ a placement method so not to disturb or damage utilities in trenches.
- D. Backfill against supported foundation walls. Backfill simultaneously on each side of unsupported foundation walls, until supports are in place.
- E. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.
- F. Make changes in grade gradual. Blend slopes into level areas.
- G. Remove surplus backfill materials from site.
- H. Leave stockpile areas completely free of excess fill materials.
- I. Filling: After sub grade compaction, has been approved by the Architect, spread the remaining fill material in layers not exceeding eight inches (8") around the building in un-compacted thickness.
 - 1. Fill all areas outside of building, protecting the underground utilities first, with amount of fill on site.
 - 2. Fill all areas under slabs and paving with "structural fill". Extend the "structural fill" outside of the paved areas a distance equal to the depth of excavation.
 - 3. Fill below concrete slabs: After the sub grade preparation work, and all required filling, compacting, and rough grading work to bring sub grade to proper alignment and cross section has been completed, provide a 6-inch layer of drainage fill under all interior slabs.
 - 4. Filling and backfilling shall be done carefully so as to avoid damage to foundation, walls, pipes, conduits, etc. Filling shall be done evenly on both sides of pipes and wall to avoid wedging or eccentric action.
- J. Moisture-conditioning: Water or aerate the fill material as necessary and thoroughly mix to obtain a moisture content which will permit proper compaction in accordance with specified compaction procedures.
- K. Compaction, general: Compact each soil layer to at least the specified compaction procedures.
- L. Degree of compaction requirements, as follows:
- M. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose Depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- N. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- O. Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557: 95% of modified proctor.
 - 1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing sub grade and each layer of backfill or fill material at 95 percent.
 - 2. Under lawn or unpaved areas, scarify and re-compact top 6 inches below sub grade and compact each layer of backfill or fill material at 90 percent.

- P. Filling against fresh concrete and masonry walls:
1. Special care is required when filling against walls.
 2. Do not permit heavy trucks, excavators, or other heavy equipment to be driven in areas within 10'-0" of any such wall without written approval of the County. In the event the Contractor elects to brace a wall to accommodate trucks, compaction equipment, scaffolding, or other surface loads adjacent to walls, the design of bracing and the responsibility for its installation and performance and any damage to walls resulting from these operations are those of the contractor. Compaction of soils adjacent to walls shall be done using "manual" compaction equipment (jumping, plate vibrators, etc.).
- Q. Jetting: Unless specifically approved in writing by the Architect, jetting will not be permitted.

3.06 TRENCHING

- A. General:
1. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these Specifications. Trenching to be done before rough grading.
 2. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for caulking, joining, backfilling and compacting.
- B. Depth:
1. Trench as required to provide the elevations shown on the Drawings.
 2. 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.
- C. Correction of faulty grades:
1. Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the Architect and then compact to provide a firm and unyielding sub grade and/or foundation to the approval of the Architect and at no additional cost to the Owner.
- D. Trench bracing:
1. Properly support all trenches in strict accordance with all pertinent rules and regulations including OSHA requirements.
 2. Brace, sheet, and support trench walls in such a manner that they will be safe and that a round 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.
 3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
 4. Arrange all bracing, sheeting, and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded for enough to provide sufficient strength.
- E. Removal of trench bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported."
- F. Grading and stockpiling trenched material:
1. Control the stockpiling of trenched material in a manner to prevent water running into the excavations.
 2. Do not obstruct surface drainage but provide means whereby storm and wastewaters are diverted into existing gutters, other surface drains, or temporary drains.

3.07 FIELD QUALITY CONTROL

- A. Provide for visual inspection of bearing surfaces.
- B. Treatment after completion of grading:
 - 1. After grading is completed and the County has finished his inspection, permit no further excavation, filling, or grading except with the approval of and inspection of the County.
 - 2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.08 PRODUCT APPROVAL

- A. Additional fill material, if required, shall be provided under this Section as part of the Contract Price. All fill material shall be submitted to the Architect for review as to suitability. Acceptance by Architect in no way eliminates or reduces the Contractor's obligation to meet performance standards contained in these Specifications.
- B. For approval of imported fill material, notify the Architect at least four working days in advance of intention to import material, designate the proposed borrow area, and permit the Architect to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.
- C. All testing and review of fill materials will be done by the soil-testing laboratory selected by the Owner.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

Section 32 12 16 ASPHALT PAVING

PART 1 - GENERAL

- 1.01 Provide new asphalt pavement Service Path adjacent to the south and east building façade. See Site Plan.
- 1.02 Provide new asphalt pavement Driving Lane from the south overhead door to the sidewalk and new curb cut adjacent to Yout Street. See Site Plan.

PART 2 - PRODUCTS

- 2.01 Asphalt pavement Service Path
 - A. 9" Pavement, see Detail on Plan Sheet A1.6
 - B. Compacted appropriate Sub-Grade
 - C. 6" compacted dense aggregate Base Course
 - 1. 1.25" Gradation (per Section 305.2.2.1 of the "State Specifications")
 - 2. Base Course shall extend a minimum of 12 inches beyond the edge of pavement.
 - D. 3" HMA Pavement, WSDOT Type E-0.3
 - 1. 1.50" thick Lower Course (19 mm gradation), PG 64-22 or 5B-28
 - 2. 1.50" thick Upper Course (9.5 mm gradation), PG 64-22 or 5B-28
- 2.02 Asphalt pavement Driving Lane
 - A. 12" Pavement, see Detail on Plan Sheet A1.6
 - B. Compacted appropriate Sub-Grade
 - C. 8" compacted dense aggregate Base Course
 - 1. 1.25" Gradation (per Section 305.2.2.1 of the "State Specifications")
 - 2. Base Course shall extend a minimum of 12 inches beyond the edge of pavement.
 - D. 4" HMA Pavement, WSDOT Type E-0.3
 - 1. 2.25" thick Lower Course (19 mm gradation), PG 64-22 or 5B-28
 - 2. 1.75" thick Upper Course (9.5 mm gradation), PG 64-22 or 5B-28

PART 3 -- EXECUTION

- 3.01 ASPHALTIC CONCRETE PAVEMENT SHALL BE WISC DOT TYPE E-0.3 MEETING THE REQUIREMENTS OF SECTION 460 OF THE "STATE SPECIFICATIONS". PAVEMENT SHALL BE INSTALLED IN TWO (2) LIFTS IN ACCORDANCE WITH THE "TYPICAL SECTIONS & CONSTRUCTION DETAILS" SHEET(S) OF THE PLAN SET. A TACK COAT SHALL BE INSTALLED BETWEEN THE LOWER AND UPPER COURSES IN ACCORDANCE WITH SECTION 455.3.2 OF THE "STATE SPECIFICATIONS".
- 3.02 DENSE AGGREGATE BASE COURSE SHALL MEET THE REQUIREMENTS OF SECTION 305 OF THE "STATE SPECIFICATIONS". THE BASE SHALL BE EITHER EIGHT (8") OR SIX (6") INCHES TOTAL IN ACCORDANCE WITH THE "TYPICAL SECTIONS & CONSTRUCTION DETAILS" SHEET(S) OF THE PLAN SET AND SHALL BE CONSTRUCTED IN FOUR-INCH (4") LIFTS ACCORDING TO SUBSECTION 305.3.2.2 OF THE "STATE SPECIFICATIONS".

END OF SECTION

Section 32 13 13 CONCRETE PAVING

PART 1 - GENERAL

- 1.01 Provide new concrete curb & gutter, apron and sidewalk at new 16 ' wide curb cut at Yout Street. See Site Plan.

PART 2 - PRODUCTS

- 2.01 CONCRETE: CONCRETE FOR SIDEWALKS, CURB & GUTTER, APRONS, SHALL BE GRADE A-FA, AIR-ENTRAINED, AS IN SUBSECTION 501.3.1 OF THE "STATE SPECIFICATIONS". ALL EXTERIOR CONCRETE SHALL BE "READY-MIXED" AND RECEIVE A BROOM FINISH. ALL CONCRETE WORK SHALL BE CURED IN ACCORDANCE WITH THE REQUIREMENTS OF SUBSECTION 415.3.16 OF THE "STATE SPECIFICATIONS".

PART 3 -- EXECUTION

- 3.01 COORDINATE DEMOLITION AND CONSTRUCTION WITH APPROPRIATE CITY OF RACINE PUBLIC WORKS DEPARTMENT AUTHORITIES.
- 3.02 PROVIDE AND MAINTAIN APPROPRIATE GUARDS AND BARRICADES TO PROTECT THE PUBLIC USE OF SIDEWALKS AND ROADWAYS.
- 3.03 "PUBLIC" CONCRETE SIDEWALKS SHALL BE PLACED ACROSS A DRIVEWAY OPENING SHALL BE SIX INCHES (6") IN THICKNESS ON EIGHT INCHES (8") OF COMPACTED BASE COURSE. ALL PUBLIC SIDEWALKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE STANDARD CITY OF RACINE TYPICAL CONSTRUCTION DETAILS AND REQUIREMENTS.

END OF SECTION