

PROJECT MANUAL

Project:

**DEERFIELD HILLS COMMUNITY CENTER
ADDITIONS AND ALTERATIONS**

LKA PROJECT NO. 15-003

Client:

COLORADO SPRINGS PARKS and RECREATION &
COMMUNITY SERVICES
COLORADO SPRINGS, COLORADO

Date:

NOVEMBER 19, 2015

LKA PARTNERS, INC.

A Professional Corporation
for Architecture/Planning

430 North Tejon Street, Suite 208
Colorado Springs, CO 80903
719 / 473-8446

PROJECT MANUAL

FOR

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS AND ALTERATIONS

COLORADO SPRINGS PARKS AND RECREATION & COMMUNITY SERVICES
COLORADO SPRINGS, CO

PROJECT NO. 15-003

ARCHITECTS

THE LKA PARTNERS, INC.
430 NORTH TEJON STREET, SUITE 208
COLORADO SPRINGS, CO 80903
719 / 473-8446

November 19, 2015

PROJECT DIRECTORY

PROJECT NAME: DEERFIELD HILLS COMMUNITY CENTER ADDITIONS & ALTERATIONS

THE LKA PARTNERS, INC.
430 North Tejon Street, Suite 208
Colorado Springs, CO 80903
719/ 473-8446
719/ 473-8448 (FAX)

ARCHITECTS

TERRA NOVA ENGINEERING
104 S Cascade # 205
Colorado Springs, CO 80903
719/ 635-6422
719/ 635-6426 (FAX)

CIVIL ENGINEERS

HCDA, INC.
545 East Pikes Peak Avenue
Suite 100
Colorado Springs, CO 80903
719/ 633-7784
719/ 471-3173 (FAX)

STRUCTURAL ENGINEERS

PLANT ENGINEERING CONSULTANTS
320 W Fillmore Suite 100
Colorado Springs CO 80907
719 473 7077
719 473 7025 (FAX)

MECHANICAL ENGINEERS

PLANT ENGINEERING CONSULTANTS
320 W Fillmore Suite 100
Colorado Springs CO 80907
719 / 473 7077
719 / 473 7025 (FAX)

ELECTRICAL ENGINEERS

ALTITUDE LAND CONSULTANTS, INC.
201 E. Las Animas Ste 113
Colorado Springs, CO 80903
719 231 3959

LANDSCAPE ARCHITECTS

ADDRESS ALL QUESTIONS DURING BIDDING PERIOD TO THE ARCHITECT.

TABLE OF CONTENTS
FOR
PROJECT MANUAL

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS & ALTERATIONS
COLORADO SPRINGS PARK AND RECREATION DISTRICT & COMMUNITY SERVICES

PROJECT NO. 15-003

November 19, 2015

THE PAGES IN EACH SECTION ARE NUMBERED. THE LAST PAGE OF EACH SECTION CONTAINS THE WORDS "END OF SECTION". NOTIFY ARCHITECT IF ANY PAGE IS MISSING IN A SECTION OF YOUR PROJECT MANUAL.

PROCUREMENT AND CONTRACTING REQUIREMENTS SUBGROUP
DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

DOCUMENTS

00 31 19 Information Available to Bidders
Attachments: Notice / CADD Files
Agreement / Electronic Media
Request for Information/Interpretation
Remedial Action Request

GENERAL REQUIREMENTS SUBGROUP
DIVISION 01 - GENERAL REQUIREMENTS

01 11 13 Summary of Work
01 21 13 Allowances
01 22 00 Unit Prices
01 23 00 Alternates
01 29 73 Schedule of Values
01 31 00 Project Management and Coordination
01 31 19 Project Meetings
01 33 00 Submittals
Attachments: Sample Schedule and Log of Selected Submittals
01 33 23 Shop Drawings, Product Data, and Samples
01 35 16 Alteration Project Procedures
01 41 00 Regulatory Requirements
01 42 13 Reference Standards and Abbreviations
01 45 00 Quality Control
01 45 27 Measurement Protocols For Compliance Verification

01 50 00	Construction Facilities and Temporary Controls (Alteration Projects or Small Projects)
01 56 39	Tree and Plant Protection
01 60 00	Material and Equipment
01 71 23	Field Engineering
01 73 29	Cutting and Patching
01 74 23	Final Cleaning
01 77 00	Contract Closeout Requirements, Intermediate and Final

FACILITY AND CONSTRUCTION SUBGROUP

DIVISION 2 EXISTING CONDITIONS

02 41 00 Selective Demolition

DIVISION 3 CONCRETE

03100	03 10 00	Concrete Forms and Accessories
	03 20 00	Concrete Reinforcement
	03 30 00	Cast-In-Place Concrete
	03 39 00	Moisture Vapor and Alkalinity Control System
	03 48 16	Architectural Precast Concrete Specialties
	03 53 00	Concrete Topping (Patching)

DIVISION 4 MASONRY

	04 05 13	Pre-Blended Masonry Mortar
	04 05 16	Pre-Blended Masonry Grout
	04 05 23	Masonry Accessories
	04 20 00	Unit Masonry

DIVISION 5 METALS

05 50 00 Metal Fabrications

DIVISION 6 WOOD AND PLASTICS

	06 10 00	Rough Carpentry
	06 17 53	Prefabricated Wood Trusses
	06 20 00	Finish Carpentry
	06 41 00	Custom Casework

DIVISION 7 THERMAL AND MOISTURE PROTECTION

	07 13 00	Sheet Membrane Waterproofing
	07 21 00	Building Insulation
	07 25 00	Weather Resistive Barrier
	07 31 13	Fiberglass Shingles
	07 42 13	Baked Enamel Building Panels
	07 46 23	Wood Siding
	07 52 16	SBS Modified Bitumen Roofing
	07 62 00	Flashing and Sheet Metal
	07 72 00	Roof Accessories
	07 92 00	Joint Sealants

DIVISION 8 OPENINGS

08 11 13 Hollow Metal Doors and Frames
08 14 29 Prefinished Wood Doors
08 31 13 Access Doors
08 41 13 Aluminum Storefront Framing
08 71 00 Door Hardware
08 81 00 Glazing

DIVISION 9 FINISHES

09 21 00 Gypsum Board Partitions and Walls
09 21 10 Gypsum Board Ceilings
09 30 00 Tiling
09 65 00 Resilient Flooring
09 68 00 Carpeting
09 91 00 Painting (standard)
09 96 23 Graffiti Resistant Coatings

DIVISION 10 SPECIALTIES

10 11 00 Visual Display Boards
10 14 00 Identifying Devices
10 14 53 Traffic Signage
10 21 13.16 Solid Phenolic Toilet Compartments
10 26 13 Corner Guards
10 28 13 Toilet Accessories
10 44 00 Fire Extinguishers Cabinets and Accessories
10 51 00 Lockers

DIVISION 11 EQUIPMENT

Not Used

DIVISION 12 FURNISHINGS

12 21 13.13 Horizontal Louver Blinds
12 32 00 Plastic Laminate Faced Casework
12 48 13.13 Floor Mat

DIVISION 13 SPECIAL CONSTRUCTION

Not Used

DIVISION 14 CONVEYING SYSTEMS

Not Used

DIVISION 15 THROUGH DIVISION 19

Not Used

FACILITY SERVICES SUBGROUP

DIVISION 20

Not Used

DIVISION 21
Not Used

DIVISION 22 PLUMBING

22 00 10	Basic Plumbing Requirements
22 05 00	Common Work Results for Plumbing
22 05 13	Common Motor Requirements for Plumbing Equipment
22 05 53	Identification for Plumbing Piping and Equipment
22 07 19	Plumbing Piping Insulation
22 10 05	Plumbing Piping
22 10 06	Plumbing Piping Specialties
22 30 00	Plumbing Equipment
22 40 00	Plumbing Fixtures

DIVISION 23 HEATING, VENTILATING AND AIR CONDITIONING

23 00 10	Basic Mechanical Requirements
23 05 00	Common Work Results for HVAC
23 05 13	Common Motor Requirements for HVAC Equipment
23 05 23	Valves
23 05 29	Hangers and Supports for HVAC Piping and Equipment
23 05 53	Identification for HVAC Piping and Equipment
23 05 93	Testing Adjusting and Balancing for HVAC
23 07 00	HVAC Insulation
23 23 00	Refrigerant Piping
23 31 13	Metal Ducts
23 33 00	Air Duct Accessories
23 37 13	Diffusers, Registers and Grilles
23 81 27	Small Split-System Heating and Cooling

DIVISION 24 THROUGH 25
Not Used

DIVISION 26 ELECTRICAL

26 00 10	Basic Electrical Requirements
26 05 01	Minor Electrical Demolition
26 05 19	Low Voltage Electrical Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 34	Conduit
26 05 37	Boxes
26 05 53	Identification for Electrical Systems
26 09 23	Lighting Control Systems
26 24 16	Panel Boards
26 27 17	Equipment Wiring
26 27 26	Wiring Devices
26 28 13	Fuses
26 28 18	Enclosed Switches
26 51 00	Interior Lighting
26 56 00	Exterior Lighting

DIVISION 27 COMMUNICATIONS

27 10 05 Structured Cabling for Voice and Data

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

Not Used

DIVISION 29

Not Used

SITE AND INFRASTRUCTURE SUBGROUP

DIVISION 30

Not Used

DIVISION 31 EARTHWORK

31 20 00 Earth Moving
31 23 16 Trench Excavation & Backfill

DIVISION 32 EXTERIOR IMPROVEMENTS

32 12 16 Asphalt Concrete Patching
32 16 00 Site Concrete
32 17 23 Pavement Marking
32 32 00 Natural Stone Retaining Walls

DIVISION 33 UTILITIES

33 10 00 Water Utilities
33 30 00 Sanitary Sewerage Utilities
33 44 16 Prefabricated trench Drain System

END TABLE OF CONTENTS

DOCUMENT 00 31 19 INFORMATION AVAILABLE TO BIDDERS

1.01 SUMMARY

- A. This Document references information relevant to the construction of this Project that has been made available to the project bidders.
- B. The information below represents services that were provided to the Owner by others, not as a consultant to the Architect. This information regards conditions that affect the Project that are beyond the responsibilities of the Architect and the Architect's consultants. The Architect makes no representation, express or implied, as to the accuracy, completeness, or validity of the information.
- C. The referenced information below is provided for convenience only, and is not intended to be a part of the Construction Documents.
- D. In preparing his bid, each bidder shall consider and evaluate the site, the data contained in the referenced documents, as well as the Drawings and Project Manual prepared by the Architect.

1.02 SUBSURFACE INVESTIGATION

- A. Subsurface Investigation:

Results of Geotechnical Engineering Study, Deerfield Hills Community Center Addition
Kumar & Associates
Colorado Springs
September 25, 2015
Project No. 15-2-166

- B. Contractors are expected to examine the project site and the records of investigation and make, to whatever extent they deem appropriate, their own investigation of existing subsurface conditions to determine the nature, kind and character of materials to be encountered.

1.03 SITE SURVEY

Deerfield Hills Community Center
Robert A. Pisciotto, Jr. Colorado P.L.S. 38224
City of Colorado Springs
Public Works / City Engineering
30 South Nevada, Suite 402
Colorado Springs, CO. 80903
Job No. 2014057

1.04 ASBESTOS ABATEMENT WORK PLAN

Deerfield Hills Community Center
Asbestos Abatement Work Plan
Foothills Environmental, Inc.
October 18, 2015
FEI Project No. AS15109-1

END OF DOCUMENT

NOTICE

To General Contractors, Subcontractors and Sub-subcontractors (including Material and Equipment Suppliers) Concerning Use of Architect's Electronic Media (CADD Files)

1. Certain drawing information in electronic format, if requested by the successful general contractor via the attached "Agreement for Use of Electronic Data", may be provided by the Architect on a case-by-case basis for use during the construction phase of the Project. The Architect reserves the right to refuse to provide electronic media copies of the construction Contract Documents, in whole or in part, to anyone, and to change at any time and at his sole discretion, the process by which such information is provided. Therefore, bidders, contractors, subcontractors, sub-subcontractors and material and/or equipment suppliers should not rely upon the assumption that such information will be available to them.
2. If a request is approved, the Architect will assess a service charge to the successful general contractor for preparing the information in electronic format. The amount of the service charge will be \$50.00 per drawing sheet or part thereof, but in no case less than \$250.00.
3. A condition precedent to release of any information in electronic format is the proper execution of the "Agreement for Use of Electronic Data" and receipt of service charge payment.
4. A typical request and approval process is outlined below:
 - A) General Contractor submits completed and fully executed "Agreement for Use of Electronic Data" together with payment as required.
 - B) After receiving the request, Architect approves or denies request by executing the Agreement and returning a copy to Contractor and providing the intended User a compact disk (CD) containing the Electronic Data, or by refunding the submitted payment, respectively.

**AGREEMENT
FOR USE OF
ELECTRONIC DATA**

AGREEMENT BETWEEN

Architect:

LKA Partners, Inc.
A Professional Service Corporation
430 N. Tejon Street, Suite 208
Colorado Springs, CO 80903

and

Contractor:

(print Contractor's full legal Name)

(print Contractor's address – line 1)

(print Contractor's address – line 2)

Concerning Architect's Project:

Deerfield Hills Community Center Additions & Alterations
Colorado Springs Parks & Recreation, Cultural Services
Colorado Springs, Colorado

Architect's Project No. 15-003

Whereas Contractor has requested Architect to provide to Contractor's subcontractor (hereinafter referred to as "User") certain drawings in electronic data format, and Architect is willing to provide said drawings in electronic data format under certain conditions, Architect and Contractor agree as set forth below:

User:

(print User's full legal name)

(print User's address – line 1)

(print User's address – line 2)

Drawings to be provided to User in electronic data format (hereinafter referred to as "Electronic Data"):

(identify sheet numbers)

1. Contractor shall pay to Architect a service charge in an amount equal to \$50.00 per drawing, but in no case less than \$250.00. Such charge is intended to cover Architect's costs in reproducing and providing the Electronic Data to User, and shall not be deemed to create a sale or purchase.
2. After receipt of payment, Architect shall produce the Electronic Data recorded on non-rewritable compact disk (CD) utilizing whatever computer aided design and drafting (CADD) software and version the Architect originally used to create Construction Drawings for the Project. Once the CD is produced, no refund of the service charge will be made for any reason.
3. Contractor specifically acknowledges the following with regard to the Electronic Data:
 - (a) It is provided at Contractor's specific request, solely as a convenience, to aid User in coordinating its own work on the Project.
 - (b) It is Architect's instrument of service prepared by Architect and/or its consultants.
 - (c) It may contain errors or omissions, or be corrupted or infected with malicious software such as a virus, worm, trojan, rootkit, or the like.
 - (d) It may be in-process and may not, as provided, contain all available information and/or reflect the scope/status of the design of the project as of the current date or date of use. Information and changes issued by addenda may not be reflected in the Electronic Data.
 - (e) It cannot be used for deriving dimensions by manual or electronic scaling.
 - (f) It does not constitute all or any portion of the Contract Documents or Construction Drawings for the project, and only properly signed and sealed hardcopy drawings shall be considered part of the Contract Documents.
 - (g) It is not to be used for construction without User's verification against properly issued hardcopy Contract Documents and/or Construction Drawings. Signed and sealed hardcopies of drawings and specifications shall always govern where differences arise.

- (h) Complete and proper display of the Electronic Data requires specific equipment (hardware) and operating systems/programs (software) which the User is solely responsible for determining, acquiring and maintaining.
 - (i) Data created using software programs can be subject to error caused by error(s) in the program itself.
 - (j) Data recorded/copied/saved electronically can be subject to error resulting in inadvertent omission, addition or alteration of information.
 - (k) Data created by electronically scanning hardcopy drawings can be subject to error created by inadvertent omission, addition or alteration of information.
 - (l) The Electronic Data was created using software programs and may have been created by electronically scanning hardcopy drawings.
 - (m) Data stored on electronic media may be subject to accidental erasure or uncontrollable deterioration and therefore Architect shall not be responsible for the completeness or accuracy of the Electronic Data.
 - (n) Contractor assumes all risks of loss or damage associated with installing, copying, downloading, accessing, interfacing or otherwise using or relying upon the Electronic Data.
5. The Electronic Data shall be provided to User on a compact disk ("CD") only.
 6. Because the Electronic Data can be modified, unintentionally or otherwise, Architect reserves the right to remove all indicia of ownership and/or involvement from the Electronic Data.
 7. Under no circumstances shall transfer of the Electronic Data for use by Contractor or User be deemed a sale by Architect and Architect makes no warranties, express or implied, of any nature including warranties of merchantability or fitness for a particular purpose.
 8. Architect and/or its consultants shall be deemed the author(s) of the Electronic Data and shall retain all common law, statutory and other rights, including copyrights, to such information, and providing same to Contractor or User does not constitute a waiver or relinquishment of such rights.
 9. Differences may exist between the Electronic Data and corresponding hard copy documents. Signed and sealed hard copies of drawings and specifications shall always govern where differences arise.
 10. Neither Architect nor any of its consultants shall have responsibility whatsoever to advise Contractor or User of any addenda information or revisions made after the date indicated on the Electronic Data.
 11. Contractor hereby agrees and warrants that Contractor and/or User has sufficient education, training and skill to properly interpret and apply the information contained in the Electronic Data, and that neither Contractor nor User will use or permit the use, in whole or in part, of the Electronic Data for any purpose(s) other than to aid Contractor or User in coordinating its own work on the Project, and its use of the Electronic Data shall not provide a basis for relieving Contractor or User from fully complying with the requirements of the construction Contract Documents for the amount stipulated in its agreement with the Owner, Contractor, any subcontractor or any sub-subcontractor or supplier as any of these situations apply.
 12. In no event shall Architect, its directors, officers, employees, agents or consultants have any liability or responsibility of any nature whatsoever arising directly or indirectly from the installation, copying, downloading, accessing, interfacing, use or reliance upon Electronic Data. Contractor waives all claims of any nature whatsoever against Architect, its directors, officers, employees, agents or consultants in connection with same, and Contractor agrees to the greatest extent permitted by law to defend, indemnify, and hold Architect, its directors, officers, employees, agents and consultants harmless from all liability, loss, claim and damage, including costs, expenses and attorneys' fees arising out of or in connection with same.
 13. The Electronic Data is for the exclusive use of User including its bona fide employees. Contractor warrants that it will not lend, rent, lease sublicense or in any manner whatsoever furnish the Electronic Data to any other subcontractor, sub-subcontractor, entity, person, or other user. Architect reserves all rights and claims

it may have against Contractor and authorized third parties for the unauthorized installation, copying, downloading, accessing, interfacing, use duplication and/or distribution of the Electronic Data.

- 14. The CD containing the Electronic Data shall not be lent or in any manner furnished by Contractor to any other person or entity other than User. Specifically, methods of transfer over telephone lines, modems and all digital electronic devices, through "web sites", electronic mail and the like are strictly prohibited. The Electronic Data shall be transferred exclusively and directly via the CD provided by Architect.
- 15. This Agreement shall be binding upon and inure to the benefit of the respective partners, heirs, executors, administrators, successors, and assigns of Architect and Contractor.

ARCHITECT:

The LKA Partners, Inc.

(signature of corporate officer, partner or authorized agent)

(printed name)

(printed title)

(date)

CONTRACTOR:

(printed Contractor's full legal name)

(signature of corporate officer, partner or authorized agent)

(printed name)

(printed title)

(date)

REMEDIAL ACTION REQUEST

No.

Date issued: _____ From: [insert GC's name]
To: LKA Partners, Inc. _____ Contact: _____
Contact: _____ Phone #: _____
Email Address/Fax #: _____ Email Address/Fax: _____

Project Name: _____ Work category: _____
Architect's project #: _____ Drawing/detail reference: _____
Priority status code: _____ Specification reference: _____

Priority Status Codes:
A= Immediate attention requested B= Please respond within 5 days C= Low priority D= confirmation only, needed

REQUEST TITLE: _____

PROBLEM DESCRIPTION:

Attachments: Yes / No

CONTRACTOR'S PROPOSED SOLUTION:

Attachments : Yes / No

ARCHITECT'S or CONSULTANT'S RESPONSE:

Response By: _____ Company: _____ Date: _____

Attachments: Yes / No

For: LKA Partners, Inc.

[insert LKA rep's name here]

Date: _____

DIVISION 1 GENERAL REQUIREMENTS
SECTION 01 11 13 SUMMARY OF WORK

PART 1 – GENERAL

1.01 CONDITIONS AND REQUIREMENTS

Division 1 - General Requirements shall govern work under all Divisions of the Specifications.

1.02 SCHEDULE OF DRAWINGS, SPECIFICATIONS AND ADDENDA

- A. Drawing Index: Refer to List of Drawings on Title Sheet TS-1.
- B. Project Manual: Deerfield Hills Community Center Additions & Alterations, dated November 19, 2015.
- C. Addenda: All Addenda issued prior to the bid date.

1.03 EXAMINATION OF SITE

- A. Site Visit: Failure to visit site will in no way relieve any Contractor from necessity of furnishing materials or performing work that may be required to complete work in accordance with Drawings and Specifications without additional cost to Owner.
- B. Existing Utilities: The locations of all Existing Utilities, as indicated on the Site Surveys and on the various Site Plan Drawings, are approximate. Contractor shall be responsible for verifying locations and depths of all underground and above ground utilities, whether or not indicated on the Site Surveys and the various Site Plans, prior to construction. Any damage to existing utilities scheduled to remain shall be the Contractor's responsibility and shall be repaired at no cost to the Owner.
Contractor shall establish existing sanitary sewer service line depth at the new point of connection and report this information to the Architect prior to beginning new pipe installation.

1.04 MARKING OF BUILDING MATERIALS

The use of Water Based or Permanent Markers for marking of any building material on this project is prohibited. Marking of building materials for fitting, cutting, identification, or any other purpose must be done by Pencil only.

1.05 CONTRACTS

All work under this contract will be executed under one prime contract between the Owner and the General Contractor.

1.06 **SUBSTITUTIONS**

- A. **Each bidder represents that the bid is based on the materials and equipment described in the Contract Documents.**
- B. **Direct reference in the specifications or drawings to any article, device, product, materials, fixture, form or type of construction, by name, make, or catalog number, with or without the words "or equivalent" or "or approved substitute", shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases may, at his option, use any article, device, product, material, fixtures, form or type of construction which is deemed, in the judgment of the Architect and expressed in writing, as an equivalent to that named.**
- C. **In order to allow the fullest competition, consistent with the Owner's interest, the Architect will give consideration, prior to submission of bid proposals, to requests for**

approval of products competitive with and similar to those specified by proprietary name.

To be considered for approval, all substitution requests shall:

- 1. Be in writing.**
- 2. Be delivered to the City of Colorado Springs, Procurement Services Division, 30 South Nevada Avenue, Suite 201, Colorado Springs, CO 80903 no later than 1:00 PM (MST) December 8, 2015. Requests for approval after the above date will not be considered.**
- 3. Be accompanied by complete technical data, including laboratory reports, if applicable, on the proposed product. Each item proposed for substitution shall be clearly identified.**
- 4. Submit listing of local installations where proposed products have been provided, include names and phone numbers of references familiar with the installation and performance of products.**
- 5. Explain fully the differences, if any, between the proposed product and the product named in the Specifications.**
- 6. State any time implications of the use of the proposed substitution.**
- 7. Give complete information on changes, in the event the proposed product requires for its proper initiation, any change to the drawings or specifications for related work.**
- 8. Submit actual casework and window samples with any request for substitution of specified manufactured cabinets and aluminum windows.**

- D. If the request has been submitted in compliance with the above stated requirements and if the Architect and the Owner decide the proposed product is of equivalent value to the products named in the Specifications as suitable in every respect for use in the project, the Architect will accept the item and list it in an Addendum which will be sent to all parties who have received complete sets of the Contract Documents.**
- E. Attention is called to the fact that prior approval is required only for substitution of those products not specified by proprietary name or as an approved manufacturer. Manufacturers and systems listed within a specification section are acceptable subject to their fully meeting the detail requirements of that particular section. No increase in the Contract Sum will be considered whether or not the request for substitution is approved.**

1.07 SEPARATE CONTRACTS

- A. The Owner intends to contract separately for the following items. The General Contractor shall coordinate with these separate contractors to the extent required to accommodate the work provided by these separate contracts.**
- 1. Asbestos Abatement**
 - 2. Fire Alarm / Burglar Alarm / Video Surveillance**
 - 3. Access Control**
- B. Special Inspections: Special Inspections will be required per the 2009 International Building Code. These tests will be made at the Owner's Expense. The Contractor shall coordinate the work schedule with the Owner's Special Inspector. The Contractor shall not take action or direction based on verbal or written communication by the Owner's Special Inspector. The Contractor shall rather initiate a Request for Information to the Architect of record and comply with the response of that Request for Information from the Architect of record.**
- C. The Owner intends to perform the following work with their own forces:**
- 1. Irrigation**

2. Voice & Data Systems – Owner will provide and install UPS, Network Servers, Routers, Switches, and Wireless Access Points. Refer to the Construction Documents for work performed under the Construction Contract.

1.08 COORDINATION

- A. Coordinate the installation of all underground and above ground piping including stratification of plenum spaces. All work installed that interferes with the work of others and was not coordinated with others will be removed and reinstalled at no extra cost to the Owner.
- B. Coordinate all electrical items both on the site and within the building envelope including stratification in plenum spaces. All work installed that interferes with the work of others and was not coordinated with others will be removed at no extra cost to the Owner.
- C. All work installed that interferes with the work of others and was not coordinated with existing conditions and the work of others shall be removed and reinstalled at no extra cost to the Owner.

1.09 CONTRACTOR USE OF PREMISES

- A. Limitations:
 - 1. Operations of the Contractor shall be limited to areas where construction work and access routes are indicated on the Construction Documents. The Contractor shall install fence as indicated and shall erect signs adjacent to the gates which read “Construction Traffic Only”. Fences and signs shall be removed by the Contractor at the conclusion of the project.
 - 2. Access to the construction area for staging for the new building shall be as indicated on the drawings. Any fire access drives must be kept open at all times while the existing building is occupied. The Contractor shall coordinate any anticipated new access driveways with the Owner.
 - 3. Protection of Property: The Contractor shall limit his operations and access to designated areas of the building. Other areas shall be left undisturbed. Any damage to such areas will require repair at the contractor’s expense.
 - 4. Hours of construction operation shall comply with local ordinances.
 - 5. Contractor must abide by the following general Site Restrictions:
 - a. No radios for entertainment purposes are allowed.
 - b. No tobacco products anywhere on the site.
 - c. The site is a “Drug Free Zone.”
 - d. No contact between the Contractor’s personnel and the Community Center staff or visitors is permitted.
 - e. Should individuals under supervision of the Contractor not comply with these Site Restrictions the Contractor shall immediately remove that individual from the project and they shall not be allowed to return to the Project site.
 - 6. When construction vehicles are moving across sidewalks, or any other pedestrian access routes, the Contractor shall provide the services of a flagman to stop all pedestrian activity in the vicinity of the access gate to the construction areas.
- B. Parking:
 - 1. The existing parking lot may be used for parking of Contractor or Subcontractor vehicles.
 - 2. The Contractor and Subcontractors may park their personal vehicles on adjacent streets in accordance with the signage posted on the streets.

3. Use of adjacent roadways or property for the purpose of parking or staging for construction related equipment or vehicles is not allowed.
 - C. Coordination with Owner: Schedule all work performed in the Building and on the site with Owner. The Community Center staff will not occupy the building during construction and all programs will be relocated to other facilities.
 - D. Toilet Facilities: The use of new and/or existing sinks, toilets, lavatories, etc. by construction personnel is strictly prohibited. The Contractor shall provide temporary toilets as required for health and sanitation.
- 1.10 CONSTRUCTION AND PHASING SCHEDULE
- A. Work Sequence: The existing building and site will not be occupied during the construction period.
 - B. 1. Contractor Site Mobilization: Pending satisfactory completion of requirements leading to the issuance of the Notice to Proceed (refer to Section 00 73 00).
 - C. Phasing: To coordinate with the Owner's separate asbestos abatement contractor, the following work sequence and phasing must be followed:
 1. Site work: Site development construction may commence upon the Notice to Proceed being issued.
 2. The asbestos abatement contractor's work inside the existing building is anticipated to be complete on or before January 11, 2016. Subject to the Notice to Proceed having been issued the General Contractor may begin his work in the building after the abatement is complete.
 3. The Contractor may, at his option, elect to work extended days (more than 8 hrs/day), double shifts or extended weeks (more than 5 days/week) to complete the construction work within the allotted schedule.
- 1.11 TIME OF COMPLETION
- A. Completion for the work associated with this project shall be achieved by the Contractor on or before May 13, 2016.
 - B. The Contractor agrees to achieve Completion on or before these dates. Refer to Document Schedule B, paragraph B.28, Schedule D, Article 109.01. for definitions and completion procedures. Completion for the entire project shall be achieved in accordance with the Contract between the Contractor and Owner.
- 1.12 COORDINATION
- A. Coordinate the installation of all underground and above ground piping, and electrical items, including stratification of plenum spaces.
 - B. All work installed that interferes with the work of others and was not coordinated with existing conditions and the work of others shall be removed and reinstalled at no extra cost to the Owner.
- 1.13 PROTECTION

The contractor shall protect from damage during demolition and construction all items to remain in place, to be removed and reinstalled, or to be removed and turned over to the Owner.

1.14 NOTICE TO CONTRACTORS REGARDING CRIMINAL RECORD CHECK

- A. To the fullest extent permitted by law, prior to assigning any employee to perform any services on the Owner's site, the Contractor shall have performed a criminal background check to determine whether such employee has been convicted of a felony or other crime that would make such person unsuitable to work around children during the prior five year period or has any known felony convictions that occurred beyond the five year period. Contractor shall not, without the prior written approval of Owner, permit a Contractor employee to perform services on a site if that employee has been convicted of any felony or other crime that would make them unsuitable to work around children. Contractor's background check must be in compliance with the Fair Credit Reporting Act and Colorado law.

- B. The Owner may, at any time, require Contractor to provide such information as is necessary to verify Contractor's compliance with its obligation noted above. The Contractor shall submit copies of all security/background checks performed within twenty-four (24) hours of a request by the Owner for such information. The Owner may request copies of these security/background checks up to twelve (12) months after completion of the specific project. Failure to complete or submit any required security/background check requested by the Owner, may result in immediate cancellation of work in process and/or removal from the active vendor and bidders list for up to one year.

PART 2 – PRODUCTS

PART 3 – EXECUTION

Not Used.

END OF SECTION

SECTION 01 21 13 ALLOWANCES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Include in the Contract Sum allowances stated in the Contract Documents or agreed upon in writing. Designate in the Construction Progress Schedule, the delivery dates for products specified under each allowance.

1.02 RELATED REQUIREMENTS

General Conditions.

1.03 ALLOWANCES

A. Costs Included in Allowances:

1. Cost of the product to the Contractor or Subcontractor, less any applicable trade discounts.
2. Delivery to the site.
3. Applicable taxes.
4. Labor to install only when Allowance includes installation.

B. Contractors Costs Included in Contract Sum:

1. Labor for installation and finishing, unless Allowance includes installation.
2. Handling at the site including unloading, uncrating and storage.
3. Protection from the elements and from damage.
4. Other expenses required to complete the installation.
5. Contractors and Subcontractors overhead and profit.

1.04 SELECTION OF PRODUCTS UNDER ALLOWANCES

A. Architect's Duties:

1. Consult with the Contractor in consideration of products and suppliers or installers.
2. Make selection in consultation with the Owner.
3. Transmit Owner's decision to the Contractor.
4. Prepare Change Orders.

B. Contractor's Duties:

1. Assist Architect and Owner in determining qualified suppliers or installers.
2. Obtain proposals from suppliers and installers as requested by Architect.
3. Make appropriate recommendations for consideration of the Architect.
4. Notify Architect promptly of any:
 - a. Reasonable objections Contractor may have against any supplier, or party under consideration for installation.
 - b. Effect on the construction schedule anticipated by selections under consideration.

1.05 CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION

A. On notification of selection, execute purchase agreement with designated supplier. Arrange for and process Shop Drawings, Product Data and Samples, as required.

B. Make arrangements for delivery. Upon delivery, promptly inspect products for damage or defects. Submit claims for transportation damage.

C. Install and finish products in compliance with requirements of referenced specification sections.

1.06 ADJUSTMENT OF COSTS

Should the net cost be more or less than the specified amount of the allowance, the contract sum will be adjusted accordingly by Change Order.

1.07 SCHEDULE OF ALLOWANCES

Section 00 42 00: Allow the sum of \$34.00/M for purchase and delivery of face brick.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 22 00 UNIT PRICES

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Quantities indicated on the quantities specified shall be included in the Contractor's Base Bid. For ADDING to the Base Bid, the unit prices described in this Section will be applied. The Contractor will be notified in writing of the quantities applicable for the unit price and the Contract Price will be adjusted accordingly by Change Order.

- B. All unit prices shall include labor, materials, equipment, services, delivery to the project, overhead, profit, insurance and other incidental expenses to complete the work specified. Work covered by unit prices shall be performed in accordance with requirements of the applicable sections of the Specifications.

- 1.02 UNIT PRICES – Patching Concrete Topping
See Section 03 53 00 for description.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 23 00 ALTERNATES

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Definitions and Explanations: "Alternates" are defined as alternate products, materials, equipment, systems, and methods, units of work or major elements of the construction, which may, at the Owner's option be selected for the work in lieu of the corresponding requirements of the base bid Contract Documents. Selection may occur prior to the Contract Date, or may be deferred for possible selection at a subsequent date. Alternates may or may not change the scope and general character of the work substantially. Refer to Owner-Contractor Agreements, and subsequent modifications thereof (If any), for the determination of which of the several scheduled alternates listed have been accepted, and are, therefore, in full force and effect as though originally included in the Contract Documents for the base bid.
- B. Notification: Immediately following the award of the Contract, the Contractor shall prepare and distribute to each entity or person to be involved in the performance of the Work, a notification of the status of each alternate scheduled and including those subsequently added by notification during bidding. Indicate which alternates have been: 1) accepted, 2) rejected, and 3) deferred for consideration at a later date as indicated. Include full description of negotiated modifications to alternates, if any.
- C. General Alternate Requirements: The description for each alternate is recognized to be incomplete and abbreviated but implies that each change must be complete for the scope of work affected. Refer to applicable sections (Division 2 through 16) and to applicable drawings for the specific requirements of the work, whether or not references are so noted in the description of each alternate. Modify surrounding work as required to integrate with the work of each alternate.

1.02 ALTERNATES

- A. ALTERNATE NO. 1 ROOM 112 NEW FINISHES
Bidders shall indicate on their Bid Forms the amount to be ADDED to their base bids forms the amount to be ADDED to their base bids for the replacement of room 112 finishes as noted on drawing A2.1 in the Finish Schedule Notes.
- B. ALTERNATE NO. 2 CONSTRUCT OFFICES 114 AND 115 / ROOM 112 NEW FINISHES
Bidders shall indicate on their Bid Forms the amount to be ADDED to their base bid forms in addition to the Bid Alternate 1 amount for the construction of new office space within Room 112, an exterior window and a computer counter as identified in the construction documents. The work includes the construction of new interior partitions, mechanical and electrical improvements, flooring, base, and painting over and above the work described in Alternate No.1.
- C. ALTERNATE NO. 3 ADDITIONAL INTERIOR PAINTING
Bidders shall indicate on their Bid Forms the amount to be ADDED to their base bid forms for the expansion of the painting scope identified in the construction documents. Refer to drawing A 2.1 floor plan and Finish Schedule Notes
- D. ALTERNATE NO. 4 REPLACE EXISTING MECHANICAL SYSTEM COOLING COILS AND CONDENSING UNITS
Bidders shall indicate on their Bid Forms the amount to be ADDED to their base bid forms for the replacement of mechanical cooling system coils and condensing units as identified in the construction documents.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

Not for Construction

SECTION 01 29 73 SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 INFORMATION INCLUDED

Requirements for preparation and submittal of the Schedule of Values

1.02 RELATED REQUIREMENTS

- A. 00 72 00: General Conditions
- B. 00 73 00: Supplementary Conditions
- C. 01 11 00: Summary of the Work
- D. 01 33 00: Submittals
- E. 01 33 23: Shop Drawings, Product Data, and Samples

1.03 GENERAL REQUIREMENTS

- A. The requirements of this specification section are in addition to and not in lieu of any other requirements of the General and Supplementary Conditions of the Contract.

1.04 SCHEDULE OF VALUES

- A. Present Schedule on AIA form G702 and continuation sheet G703.
- B. Contractor's standard form or media-driven printout will be considered upon request provided that, in the sole judgment of the Architect, organization and presentation of information is equivalent to the form provided.
- C. Following the table of Contents of Project Manual, identify each line item by number and title of specification section. As a basis for computing values for progress payments, breakout values of material, labor, and production of certain required submittals (shop drawings, product data, calculations, test data, manufacturers' instructions, and samples only) for each specification section as a separate line item. Position submittals line item as the first line item of each affected specification section, just ahead of the materials value line for a given specification section. Cost of providing all other submittals shall be included in the line item for Section 01 33 00. Round off values to the nearest whole dollar.
- D. Value (including all costs of acquisition and transportation to the Project site) of materials, products, equipment, and the like (hereinafter referred to in this Section as "materials") entering permanently into the Work shall be distributed into line items for materials value according to division of the Work as determined by pertinent specification section number.
- E. Value of labor to install materials permanently entering into the Work shall be distributed into line items for labor value according to division of the Work as determined by pertinent specification section number.
- F. Value of items such as purchased or rented tools and equipment provided by subcontractors (or Contractor when performing some portion of the Work with his own forces, e.g., rough carpentry or door installation) and used to enable labor to be performed, as well as value of materials that are expended (e.g., fuels and lubricants) in the construction process, or that otherwise do not enter permanently into the Work shall be distributed into line items for labor

value according to division of the Work as determined by pertinent specification section number.

- G. Value of items such as purchased or rented tools and equipment provided by the Contractor for use by his own forces and/or for one or more subcontractors shall be included in the appropriate Division 1 line item for labor or in the General Conditions line item.
- H. Value of labor, materials, and all other costs associated with demolition, removal, relocation, reinstallation or disposal of existing construction/items shall be presented in the line item of the specification Section covering such work. Refer to paragraph 1.04.C above.
- I. Provide additional breakout of material and/or labor values (as either or both are applicable) for line items as follows:
 - 1. General and Supplementary Conditions
 - 2. General Contractor's Bond(s)
 - 3. Liability Insurance
 - 4. Builder's Risk Insurance
 - 5. Building Permit
 - 6. Subcontractor Bonds
 - 7. 01 71 23 Field Engineering
 - a. Construction Layout
 - b. Construction Verification (As-built Survey and Certification)
 - 8. 03 30 00 Cast-in-Place Concrete
 - a. Foundations (footings & walls) & Slab on Grade
 - 9. 31 20 00 Earth Moving
 - a. Erosion Control
 - b. Site Clearing & removal of existing topsoil Natural ground preparation
 - c. Over-excavating
 - d. Subgrade and Finish Grading
 - e. Excavation, Backfill and Compaction for Foundations
 - 10. Any other item(s) required by Architect prior to Schedule of Values submittal approval.
- J. List materials and labor values of allowances, if any, as separate line items positioned as the last 2 lines of each affected specification section.
- K. List Contingency Allowance and Inspection Testing Allowance, if any, in the specified monetary amount for each allowance.
- L. Coordinate listings with Construction Schedule.
- M. Distribute subcontractors' overhead and profit amounts proportionately to the material and labor line items corresponding to the portion of the Work performed by them.
- N. Distribute Contractor's overhead and profit proportionately to all line items.
- O. Subcontracts spreadsheet: On a separate spreadsheet, list all subcontractors and the value of their subcontracts. For each major subcontract (\$10,000 or greater), list materials and labor values as separate line items. For items on which payments may be requested for stored materials, list sub-values for cost of each such stored material (including taxes, if any pertain to this Project).
- P. Submit Schedule, including separate subcontracts spreadsheet, in electronic pdf file format at least fifteen (15) calendar days before first Application for Payment. Form and content shall be

acceptable to the Architect. Transmit under a transmittal form identifying Project by title and Architect's Project number.

- Q. If Contractor is uncertain where, how, or to what level of detail to breakout the value of any item, he shall contact the Architect, in writing if requested, before submission of the Schedule of Values.
- R. If Architect requires substantiating information, submit data justifying line item amounts in question. Provide one copy of data with a cover letter.

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 31 00 PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 INFORMATION INCLUDED

- A. General Coordination Procedures
- B. Coordination Drawings
- C. Requests for Interpretation/Information (RFIs)
- D. Remedial Action Requests (RARs)

1.02 RELATED REQUIREMENTS

- A. 00 73 00 Supplementary Conditions
- B. 01 29 73 Schedule of Values
- C. 01 31 16 Mechanical and Electrical Coordination
- D. 01 32 13 Construction Schedule
- E. 01 33 00 Submittals
- F. 01 33 23 Shop Drawings, Product Data, and Samples

1.03 GENERAL COORDINATION PROCEDURES

- A. The requirements of this specification Section are in addition to and not in lieu of any other requirements of the Contract Documents.
- B. Coordination: Coordinate construction operations included in various Sections of the Project Manual to ensure efficient and orderly installation of each part of the Work. Coordinate construction activities that depend on each other for proper installation, connection and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends upon installation of other components, before or after installation of that part.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Project Construction Schedule
 - 2. Preparation of Schedule of Values
 - 3. Installation and removal of temporary facilities and controls
 - 4. Production, delivery and processing of Submittals
 - 5. Progress Meetings
 - 6. Preconstruction conferences
 - 7. Project Closeout activities
 - 8. Startup and adjustment of systems

1.04 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements specified herein and in other individual Sections, where installation is not completely shown on Shop Drawings or other required Submittals, where limited space availability necessitates

coordination, where coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity, and where specified below or elsewhere in any other Contract Document.

1. Provide Coordination Drawings for the following:
 - a. Ceiling Plenum: all areas.
 - b. Areas with exposed structure (e.g., no finished ceiling).
 - c. Roof Deck penetrations: all areas.
 - d. Mechanical, Electrical, and Telecommunications Equipment Rooms.
 - e. Penetrations of structural Elements (if not already shown on other coordination drawings): all areas.
 - f. Slab edge and embedded items: all areas.
2. Content: Project-specific information, drawn accurately to scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, electrical, telecommunications, and any other relevant systems.
 - b. Indicate dimensions shown on the Construction Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide sketches of alternate installation to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Construction Contract.
3. Meet with and carefully coordinate layout with all affected trades before preparation and submission of required Shop Drawings or other relevant Submittals. Review Coordination Drawing requirements, plans, specifications and proposed work sequencing and schedule with all affected subcontractors/trades. Resolve any discrepancies, conflicts or problems prior to proceeding with the subject work.
4. Review: Architect will review coordination drawings to confirm that the Work is being coordinated by the Contractor, but not for the details of the coordination, which are the sole responsibility of the Contractor.

B. Coordination Drawing Organization: Organize Coordination Drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, electrical, telecommunications, security system and like items. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Spaces: indicate subframing for support of ceiling and wall systems, mechanical, plumbing and electrical equipment, and related work. Locate components within ceiling plenum to accommodate layout of light fixtures and other equipment/systems required by the Construction Documents.
3. Areas with exposed structure (no finished ceiling, e.g., gymnasias, and commons spaces): indicate architectural, mechanical, plumbing and electrical equipment, and related work. Locate components to accommodate layout of light fixtures and other equipment /systems required by the Construction Documents.
4. Mechanical, Electrical, and Telecommunications Equipment Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
5. Penetrations of structural elements: Indicate penetrations and openings required for all disciplines.
6. Slab edge and embedded Items: Indicate slab edge locations, sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

1.05 REQUESTS FOR INTERPRETATION / INFORMATION (RFI)

- A. General: Immediately on discovery of the need for interpretation or addition information of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by the Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Architect's Action: Architect shall review each RFI, determine action required, and respond accordingly. Allow at least seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. Architect's action on RFIs may include a request for additional information from the Contractor, in which case Architect's time response will date from the time of receipt of the additional information.
 2. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a change request proposal according to provisions of the Contract Documents governing such an issue. If Contractor believes an RFI response warrants a change in the Contract Time or the Contract Sum, notify Architect in writing within 10 calendar days of receipt of the RFI response.
- C. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by sequential, ascending RFI number. Indicate the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and Address of Architect.
 4. Architect's Project number
 5. RFI number including RFIs that were rescinded.
 6. Brief RFI description.
 7. Date RFI was submitted.
 8. Date Architect's response was received.
- D. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) calendar days if Contractor disagrees with the response.
- E. Do not use the RFI process to request substitutions. Follow procedures outlined elsewhere in the Contract Documents pertaining to Substitution Requests.

1.06 REMEDIAL ACTION REQUESTS (RARs)

- A. General: Immediately on discovery of work incorrectly constructed or other non-compliant work, Contractor shall prepare and submit an RAR in the form specified.
1. Architect will return RARs submitted to Architect by other entities controlled by the Contractor with no response.
 2. Coordinate and submit RARs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Architect's Action: Architect shall review each RAR and respond accordingly. Architect will respond as quickly as reasonably possible. RARs received after 1:00 p.m. will be considered as received the following working day.
1. Architect's action on RARs may include a request for additional information from the Contractor, in which case Architect's time response will date from the time of receipt of the additional information.
 2. Provide Contractor's proposed solution.

- C. RAR Log: Prepare, maintain, and submit a tabular log of RARs organized by sequential, ascending RAR number. Indicate the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and Address of Architect.
 4. Architect's Project number
 5. RFAR number including RARs that were rescinded.
 6. Brief RAR description.
 7. Date RAR was submitted.
 8. Date Architect's response was received.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 31 19 PROJECT MEETINGS

PART 1 - GENERAL

1.01 PRECONSTRUCTION MEETINGS

- A. Preconstruction and Contract Accomplishment Conference: A meeting will be scheduled by the Owner within ten (10) days following Notice of Award, at which time the Contractor will submit executed bonds and insurance certificates. Administrative requirements such as subcontractor lists, schedule of values, payment applications, change order procedures, sales tax records and project closeout will be reviewed in detail.
- B. Site Mobilization Conference: A meeting will be scheduled by the Architect at the site prior to Contractor move-in. Representatives of the Contractor, Geotechnical Engineer, Owner, and Architect will be present. Job site procedures, to include the following items, will be discussed:
1. Procedures for maintaining record documents
 2. Owner's requirements
 3. Construction facilities and controls
 4. Temporary utilities
 5. Security and housekeeping procedures
 6. Materials testing.
 7. Services of Geotechnical Engineer
 8. Building layout
 9. Use of Architect's Consultants

1.02 PROGRESS MEETINGS

Regular weekly meetings shall be scheduled at Contractor's job site field office. The Contractor's Project Manager and Superintendent, Owner, and Architect will be present. Minutes of progress meetings shall be kept and distributed by the Contractor. Minutes shall record only actual statements made and items discussed during the meetings. The following items will be discussed:

1. Review of Work Progress since Previous Meeting
2. Field Observations, Problems, Conflicts
3. Status of Previous Instructions Issued
4. Problems Which Impede Construction Schedule
5. Review of Off-Site Fabrication and Material Delivery Schedules
6. Review Status of Contractor's Construction Schedule
7. Discuss Procedures to Regain Projected Schedule
8. Itemize Work for Succeeding Work Period Up to Next Progress Meeting
9. Coordination of Schedules
10. Maintenance of Quality Standards
11. Review Contractor's Submittals
12. Review Proposed Changes for Effect on Other Trades, Construction Schedule, Completion Date, and Costs
13. Coordination of Owner's Separate Contracts
14. Work In Progress during Visit
15. Other Business as Required

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 33 00 SUBMITTALS

PART 1 - GENERAL

1.01 INFORMATION INCLUDED

- A. Submittal defined
- B. Submittal Categories established
- C. Requirements, procedures, and conditions
- D. Submittal schedule requirements

1.02 RELATED REQUIREMENTS

- A. Requirements pertaining to various submittals as described in the General and Supplementary Conditions
- B. Requirements for submittals described in other individual specification Sections
- C. Shop Drawings, Product Data and Samples: Section 01 33 23

1.03 SUBMITTALS DEFINED AND CLASSIFIED

- A. A submittal is anything required in the Contract Documents to be submitted by the Contractor to the Architect. Submittals are not Contract Documents and Architect's corrections/comments made on submittals do not constitute Modifications (refer to Conditions of the Contract) to the Contract Documents.
- B. Category I submittals require approval by the Architect and include:
 - 1. Schedule of Values (approval is for format and level of detail only)
 - 2. List of Subcontractors and Material Suppliers
 - 3. Submittal schedule (approval is for format and level of information only)
 - 4. Shop drawings
 - 5. Product Data
 - 6. Samples
 - 7. Applications for Payment
 - 8. Substitution requests
 - 9. Any item specifically classified in individual Sections as a Category I submittal
- C. Category II submittals are required for the Architect's and/or Owner's information and as evidence of the Contractor's compliance with provisions of the Contract Documents. They are not required to be approved by the Architect. Consequently, Category II submittals will not be approved by the Architect and will normally not be returned to the Contractor. The Architect reserves the right to require the Contractor to resubmit any Category II submittal if the Architect becomes aware, at any time, of anything concerning the submittal which does not comply with the requirements of the Contract Documents. Any such discovery or lack thereof shall not relieve the Contractor from the obligation of having fully complied with, or the obligation to yet fully comply with, the conditions and provisions of the Contract Documents, and the Owner shall not be prevented from requiring removal and replacement of nonconforming work. Category II submittals include:
 - 1. Construction Schedule(s) and updates
 - 2. Performance and Labor and Material Payment Bonds
 - 3. Quality control plan
 - 4. Coordination drawings

5. Engineering calculations
 6. Test reports
 7. Certificates / certifications
 8. Manufacturer's instructions
 9. Contractor's list of corrections
 10. Warranties; sample and final copies
 11. Operation and Maintenance manuals / instructions
 12. Affidavits of Payment of Debts and Claims
 13. Lien waivers
 14. Consent of Surety to Final Payment
 15. All project closeout documents specified in Section 01 77 00
 16. Any item specifically classified in individual Sections as a Category II submittal
- D. For any required submittal not listed in this section, the Architect shall, upon discovery or request from the Contractor, determine the proper category of such submittal.
- E. Incomplete Submittal Packet(s): collection of submittals transmitted with required concurrent submittal(s) omitted. Refer to paragraph 1.04.G of this Section.
- F. Partial Submittal(s):
1. a shop drawing submittal that takes into account a single, uninterrupted subdivision of the total area of a building.
 2. a submittal of samples required for color, texture, pattern, or other finish (collectively, "color") selection by Architect that is inclusive of less than all such samples required to be submitted.
- 1.04 REQUIREMENTS, PROCEDURES, AND CONDITIONS
- A. The requirements of this Section are in addition to and not in lieu of any other requirements of the General and Supplementary Conditions of the Contract.
- B. Submit all submittals required by the Contract Documents and revise and resubmit as necessary to fully comply with specified requirements.
- C. Where a conflict occurs between or within specified standards and the Contract Documents, or should the Contractor have any question regarding the intent of the Contract Documents or any requirement thereof, the Contractor shall, prior to submission of any affected submittal, ensure his full understanding of said intent/requirement by making written Request for Interpretation/Information using the form provided in the Project Manual for this purpose.
- D. Contractor shall review all submittals to ensure strict conformance with requirements of the Contract Documents. Prior to transmitting each submittal, Contractor shall carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. By signing and submitting same to Architect, Contractor acknowledges that said review and coordination has been performed. Contractor's transmission of the submittal to the Architect shall constitute prima facie evidence of Contractor's compliance with the provisions of the Contract Documents relating to submittals.
- E. Deliver submittals to Architect as directed at the project pre-construction conference. Facsimile transmissions will be not be accepted.
- F. Transmit submittals under Contractor's specific transmittal form, AIA Form G810, or other form acceptable to the Architect. Transmit each group of related submittals (submittals that are required under the same specification Section) under the same transmittal form. Do not

transmit submittals required by different specification sections under the same transmittal form. Show transmission date and identify Project, Architect, Contractor, subcontractor, manufacturer, supplier, and separate shop drawing producer if pertinent. List numbers of drawings and specification Section number as appropriate.

- G. Provide all submittals required by an individual Section at the same time as a single Submittal Packet. Incomplete Submittal Packets will be returned without further review and the Contractor shall be strictly liable for all resulting delays. Each submittal type (e.g., shop drawings, product data, calculations, etc.) shall be transmitted as a separate pdf file when in electronic form, and as a separately bound document when in hard copy form.
 - H. Partial Submittals will be reviewed only in the specific cases listed in Section 01 33 23.
 - I. On at least the first page of each submittal, and elsewhere as required for positive identification, clearly indicate the specification Section number in which the item was included. When an item is being resubmitted for any reason, transmit said item under new letter of transmittal and with a revised submittal number. Resubmittals shall have the same number as the original submittal with alphanumeric suffix consecutively numbered (e.g., R1, R2, etc.).
 - J. Protocol for numbering/identification of submittals shall be as follows: specification section number (without spaces) - specification section paragraph reference - date (MMDDYY format) submittal or revised submittal is transmitted to Architect - revision suffix (e.g., 084113-1.03.A-061513-R1 designates a submittal required for Section 08 41 13, paragraph 1.03.A on June 15, 2013, first resubmittal).
 - K. Maintain an accurate submittal log for the duration of the Contract, showing current status of all submittals. Make the submittal log available to the Architect upon request.
 - L. Prepare and transmit to Architect all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery. Allow at least 15 calendar days (after receipt of submittal in Architect's office) for each review and re-review by Architect. Submittals received after 1:00 p.m. will be considered as received the following working day. Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the Contract completion date.
 - M. Specifically call attention to, Identify, make patent, and explain deviations, if any, from Contract Documents.
 - N. The Contract Documents impose upon the Contractor, subcontractors, manufacturers, suppliers, and distributors (collectively "contractor"), various responsibilities. Any statement, note or comment on any submittal that (1) diminishes, limits, disclaims, contravenes, or otherwise is inconsistent with said responsibilities, or (2) intentionally or unintentionally, imposes any responsibility whatsoever on the Architect and/or its consultants, shall have no force or effect; and shall otherwise be deemed null and void whether or not said statement, note or comment be stricken by the Architect during the submittal review process.
 - O. Notwithstanding any purported ownership and/or copyright by Contractor, any subcontractor, supplier, manufacturer, or other submittal producer, copies of all submittals will be retained by the Architect, Contractor, and Owner as part of the Project Record Documents.
- 1.05 SCHEDULE OF SELECTED SUBMITTALS
- A. General: Within 15 days after Award of Contract and before any listed items are submitted, submit an electronic copy of the Submittal Schedule as described below. Compile a complete

and comprehensive schedule of the following submittals required during the course of the Work:

1. Shop Drawings
2. Product Data
3. Samples
4. Calculations
5. Coordination drawings
6. Test data/reports
7. Manufacturer's instructions/installation manuals
8. Certificates relating to products/materials

B. For each required submittal, list the following:

1. Date submittal is due from subcontractor/originator to Contractor.
2. Date submittal is due from Contractor to Architect.
3. Date submittal is due from Architect to Contractor.

C. Architect will not accept Submittals until the Contractor completes this schedule to the satisfaction of Architect. After approval by Architect of the initial schedule information, update schedule only by adding new information and due dates relating to required resubmittals.

D. Coordination: Coordinate the schedule with all necessary subcontractors and material suppliers to ensure their understanding of the importance of adhering to the approved schedule and their ability to do so. Coordinate as necessary to ensure management and transmission of submittals described herein.

PART 2 – PRODUCTS

Not used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Shop drawing definition and requirements
- B. Product data definition and requirements
- C. Sample definition and requirements

1.02 RELATED REQUIREMENTS

- A. Requirements pertaining to Shop drawings, Product Data, and Samples as described in the Conditions of the Contract.
- B. Submittals: Section 01 33 00.
- C. Requirements for Shop drawings, Product Data, and Samples described in other Sections.

1.03 REQUIREMENTS, PROCEDURES, AND CONDITIONS

- A. The requirements of this Section are in addition to and not in lieu of any other requirements of the Conditions of the Contract or any other Contract Document.
- B. Shop drawings, product data, and samples (individually referred to in this Section as “submittal” or collectively as “submittals”) are not Contract Documents. The purpose of these submittals is to document the Contractor’s specific plan for conforming to the information and design requirements expressed in the Contract Documents.
- C. Contractor shall review all submittals to ensure strict conformance with the requirements of the Contract Documents. Contractor shall carefully review and coordinate all aspects of each item (product/material) in a submittal.
- D. Contractor’s approval required: Contractor’s unilateral approval of submittals, documented in the manner prescribed herein, is a condition precedent to review and action by Architect. Do not transmit submittals unless they have been reviewed and approved in full accord with the provisions of the Contract Documents, including but not necessarily limited to, the Conditions of the Contract, this Section, and Section 01 33 00. Contractor’s transmission of submittals to Architect shall constitute prima facie evidence of Contractor’s compliance with this provision.
- E. Approval of submittal(s) means Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittal(s) with the requirements of the Work, Contract Documents, and other pertinent submittals.
- F. By affixing Contractor’s signature (name, initials, stamp, mark or the like) to a submittal and transmitting submittal to Architect, Contractor represents and certifies that the review and coordination required by this Section has been fully performed, and the submittal is therefore approved by Contractor; notwithstanding any statement(s) on the submittal made to qualify or limit the scope of said review and/or approval.
- G. Any review or approval note or comment made on a submittal indicating that it has been submitted contrary to the provisions of the Contract Documents may cause rejection of the submittal by Architect.

- H. Contractor's signature on the first sheet of any Shop Drawing or Product Data submittal shall be understood to be in effect for all sheets included in a particular submittal (e.g., electronic pdf file or bound hardcopy).
 - I. Transmit submittals with reasonable promptness and in such sequence as to ensure efficient progress of the Work and to cause no delay in the Work or in the activities of the Owner or his separate contractors.
 - J. Submit only those submittals required by the Contract Documents. Submittals not required by the Contract Documents will not be processed by the Architect and will be either returned to the Contractor without action or discarded.
 - K. Provide all submittals required by an individual specification Section at the same time, in a single Submittal Packet. Incomplete Submittal Packets will be returned to Contractor without action.
 - L. Color assignment for review comments and corrections shall be as follows:
 - 1. Architect: contrasting red only.
 - 2. Contractor: contrasting green only.
 - 3. Subcontractor (if not producer of submittal): contrasting blue only.
 - 4. Producer of submittal: black only.
 - M. Subject to the specific requirements stated below, samples submitted for color selection for the following portions of the Work may be submitted as Partial Submittals (as defined in Section 01 33 00) and will be reviewed if submitted as such.
 - 1. Masonry units (exterior exposure).
 - N. Architect's Review: After review, submittals made under provisions of this Section shall be returned to the Contractor marked with one or more of the actions noted below, as appropriate:
 - 1. "Approved": Contractor may proceed with fabrication, purchase, or both of items so marked.
 - 2. "Furnish as Corrected": Contractor may, subject to the corrections noted, proceed with fabrication, purchase or both of items so marked.
 - 3. "Revise and Resubmit": Contractor may not proceed with fabrication or purchase.
 - 4. "Submit Specified Item" or "Rejected": Contractor may not proceed with fabrication or purchase of items so marked.
 - O. When an action of "Revise and Resubmit" is used, it applies to an entire submittal and Submittal Packet. Submittals so marked must be resubmitted meeting all requirements as if submitted for the first time, including new copies of all required submittals (both Category I and II) specified under that Section.
 - P. Submittal items returned with an action of "Submit Specified Item" or "Rejected" must be re-submitted providing revised copies of submittal information for only those items that were so marked. Re-submittals that include information or items previously reviewed and given an action by the Architect of "Approved" or "Furnish as Corrected" will not be reviewed or acted upon by the Architect again.
- 1.04 SHOP DRAWINGS
- A. Shop Drawings are drawings, diagrams, and schedules prepared by the Contractor, a subcontractor, supplier, or manufacturer to illustrate some portion of the Work. Individual Specification Sections may limit which of these entities shall produce shop drawings required under that Section. Shop drawings show fabrication details, layout or placement of materials, products, and equipment as may be required to demonstrate that such materials, products,

and equipment, and the location / position thereof, conform to the requirements of the Contract Documents. Shop drawings establish the actual detail of all manufactured or fabricated items; indicate proper relation to and coordination with adjoining work; amplify design details in relation to physical spaces and conditions of installation, and identify and incorporate minor adjustments of design or construction to suit actual conditions and/or constraints, if any are necessary for the proper use and installation of said materials, products, or equipment.

- B. Shop drawings shall not be reproductions of Contract Documents but shall be original drawings. Do not copy or submit manufacturer's standard information sheets as the basis for shop drawings. Submit drawings, drawn to accurate scale, specifically prepared for this Project. Highlight, encircle, or otherwise distinctively indicate deviations from the Contract Documents. Standard information prepared without specific reference to the Project is unacceptable as shop drawings.
- C. Unless otherwise specified in individual specification Sections, submittals specified in this Section shall be made electronically to the address specified by the Architect.
- D. Architect's review comments will be noted on the electronic copy of said shop drawings and returned to Contractor. Contractor shall make and distribute all copies required for his purposes.
- E. References: Shop drawings shall be referenced to applicable Construction Drawings and specification Sections using the identical reference marks/numbers established by the Architect and his consultants.

1.05 PRODUCT DATA

- A. Product Data are illustrations, schedules, performance charts, graphs, and/or facts, printed descriptions, brochures, catalog cuts, diagrams, graphic depictions, pictures, manufacturer's color or finish charts, and other such information furnished by the Contractor to describe a manufactured material, product, assembly, or system for some portion of the Work. Where product data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".
- B. Unless otherwise specified in individual specification sections, submit one (1) electronic copy of brochure material.
- C. Mark each copy to show applicable choices and options. Where printed product data includes information on several products, some of which are not required, strike through all information that does not pertain to the required product(s).
- D. References: Product Data shall be referenced to applicable construction drawings and specification Sections using the identical reference marks/numbers established by the Architect and his consultants.

1.06 SAMPLES

- A. Samples are physical examples of individual materials, products, equipment, devices, and items (collectively "materials"), or assemblies of materials furnished by the Contractor for incorporation into the Project. Samples include natural and manufactured or fabricated materials. Samples are not imitations or simulations of anything else and are made of the actual material(s) to be incorporated into the Project. Submit samples as may be required by the Architect to determine whether the kind, quality, construction, workmanship, finish, color, and other characteristics of the materials proposed by the Contractor conform to the required characteristics of the various parts of the Work.

- B. Within 30 days of Award of Contract, the Contractor shall deliver to the Architect two (2) complete collections of all samples (of sufficient size to establish general visual effect) required by individual Sections for a color, texture, pattern, or other finish (collectively, "color") selection by the Architect, as well as two (2) samples of any item which has been specified in individual Sections with color selection already made. A comprehensive list of all samples delivered shall be included and shall cross-reference each sample to the appropriate Section number. Upon receipt of a complete collection of such samples the Architect will, with reasonable promptness and after receiving any required Owner approval, document the necessary selections, and deliver to the Contractor a schedule of the selections made.
- C. **Except as indicated elsewhere in this Section, the color selection process will not begin until all samples required by Paragraph 1.06.B are properly submitted, and color selection will otherwise not be made on an individual basis.** Samples other than those described in Paragraph 1.06.B shall be submitted as part of, and concurrently with, all other submittals required under a given Section.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 35 16 ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Coordinate work of trades and schedule elements of alterations and renovation work by procedures and methods to expedite completion of the work.
- B. In addition to demolition specified in Section 02 41 00 and demolition specifically shown on the drawings; cut, move, and remove items as necessary to provide access or to allow alterations and new work to proceed. Include such items as:
 - 1. Repair or removal of hazardous or unsanitary conditions.
 - 2. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit, and wiring.
 - 3. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals, and deteriorated concrete.
 - 4. Cleaning of surfaces and removal of surface finishes, as needed to install new work and finishes.
- C. Patch, repair, and refinish existing items to remain, to the specified conditions for each material, with transition to adjacent new items of construction.

1.02 RELATED REQUIREMENTS

- A. Cutting and Patching: Section 01 73 29.
- B. Construction Facilities and Temporary Controls: Section 01 50 00.
- C. Selective Demolition: Section 02 41 00.

1.03 ALTERATIONS, CUTTING, AND PROTECTION

- A. Assign the work of moving, removal, cutting, and patching to trades qualified to perform the work in a manner to cause least damage to each type of work. Provide means of returning surfaces to appearance of new work.
- B. Perform cutting and removal work to remove minimum necessary in a manner to avoid damage to adjacent work. Cut finish surfaces such as paving, concrete slabs, masonry, tile, plaster, or metals by methods to terminate surfaces in a straight line at a natural point of division.
- C. Protect existing finishes, equipment and, adjacent work which is scheduled to remain, from damage. Protect existing and new work from weather and extremes of temperature.
 - 1. Maintain existing interior work above 60 degrees F.
 - 2. Provide weather protection, waterproofing, heat, and humidity control as needed to prevent damage to remaining existing work and new work.
- D. Provide temporary enclosures to separate work areas from existing building and from areas occupied by Owner, and to provide weather protection.

PART 2 - PRODUCTS

2.01 PRODUCTS FOR PATCHING, EXTENDING, AND MATCHING

- A. Provide same products or types of construction as that in existing structure, as needed to patch, extend, or match existing work. Generally Contract Documents will not define products or standards of workmanship present in existing construction; Contractor shall determine products

by inspection and any necessary testing and workmanship by use of the existing as a sample of comparison.

- B. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed as necessary to make Work complete and consistent.

PART 3 - EXECUTION

3.01 PERFORMANCE

Patch and extend existing work using skilled mechanics that are capable of matching existing quality of workmanship. Quality of patched or extended work shall be not less than that specified for new work.

3.02 LAYING OUT WORK

- A. Verify dimensions and elevations indicated in layout of existing work. Refer discrepancies between drawings, specifications, and existing conditions to Architect for adjustment before work affected is performed. Failure to make such notification shall place responsibility upon Contractor to carry out work in satisfactory manner.
- B. The Contractor shall be held responsible for the location and elevation of the construction contemplated by the Construction Documents.
- C. Prior to commencing work, carefully compare and check drawings that affect the location or elevation of the work to be executed. Should any discrepancy be found, immediately report the same to the Architect for verification and adjustment.

3.03 LOCATION OF EQUIPMENT AND PIPING

- A. Drawings showing location of equipment, piping, ductwork, etc., are diagrammatic and job conditions may not always permit their installation in the location shown. When this situation occurs, it shall be brought to the Architect's attention immediately and the relocation determined in a joint conference.
- B. If the Contractor removes / relocates any items not required by Contract without first obtaining Architect's approval, he shall reinstall items to original condition and location.

3.04 PATCHING EXISTING FACILITIES

Existing structures, facilities, etc., which are damaged or removed due to required construction work, shall be patched, repaired, or replaced, and be left in their original state of repair by the Contractor, to satisfaction of the Architect.

3.05 INTEGRATING EXISTING WORK

- A. Protect existing construction from damage.
- B. Contractor's operations shall be confined to the immediate vicinity of the new work and shall not in any way interfere with or obstruct the ingress or egress to and from adjacent facilities.
- C. Where new work is to be connected to existing work, special care shall be exercised not to disturb or damage the existing work more than necessary. Damaged work shall be replaced, repaired, and restored to its original condition at no cost to the Owner.

3.06 ADJUSTMENTS

- A. Where partitions are removed, patch floors, walls and ceilings with finish materials to match existing. Where removal of partitions results in adjacent spaces becoming one, rework floors and ceilings to provide smooth planes without breaks, steps or bulkheads. Where extreme change for plane occurs, request instructions from Architect as to method of making transition.

- B. Trim and refinish existing doors as necessary to clear new floor finish.

3.07 DAMAGED SURFACES

- A. Patch and replace with new material to match any portion of an existing finished surface which is damaged, lifted, discolored, or shows other imperfections which is identified in the Contract.
- B. Provide adequate support of substrate prior to patching the finish.
- C. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.
- D. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.

3.08 TRANSITION FROM EXISTING TO NEW WORK

When new work abuts or finishes flush with existing work, make a smooth transition. Patch work shall match existing adjacent work in texture and appearance so that the patch or transition is invisible at a distance of five (5) feet. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.09 DUST CONTROL

Precaution shall be exercised at all times to control dust created as a result of any operations during the construction period. If serious problems arise due to air borne dust, and when directed by Architect, operations causing such problems shall be temporarily discontinued and necessary steps taken to control the dust.

3.10 FIRE PROTECTION

- A. Maintain good housekeeping practices to reduce the risk of fire damage and injury to workmen. Scrap materials, rubbish and trash shall be removed daily from in and about the work area and shall not be permitted to be scattered to adjacent areas.
- B. Suitable storage space shall be provided outside the immediate building area for storing flammable materials and paints; no storage will be permitted in the building. Excess flammable liquids being used inside the building shall be kept in closed metal container and removed from the building during unused periods.
- C. A fire extinguisher shall be available at each location where cutting or welding is being performed. Where electric or gas welding or cutting work is done, interposed shields of incombustible material shall be used to protect against fire damage due to sparks and hot metal. When temporary heating devices are used, a watchman shall be present to cover periods when other workmen are not on the premises.
- D. Provide fire extinguishers in accordance with the recommendations of National Fire Code, NFPA Standards Nos. 10 and 241.

3.11 CLEANING

- A. Perform periodic and final cleaning as specified in Sections 01 74 23, 01 50 00 and as follows:
 1. Clean Owner-occupied areas daily, when used by Contractor.
 2. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.
- B. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.
- C. At completion of work in each area, provide final cleaning and return space to a condition suitable for use by Owner.

END OF SECTION

Not for Construction

SECTION 01 41 00 REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 PERMITS AND FEES

See the Supplementary Conditions

1.02 APPROVAL AND RECOMMENDATION AGENCIES

- A. The Pikes Peak Regional Building Department has jurisdiction for approval of this project. Codes that have been adopted are:
- B. The applicable codes for this project are:
1. 2011 Pikes Peak Regional Building Code
 2. International Building Code - 2009 Edition, First Printing
 3. International Fire Code - 2009 Edition, First Printing - including Appendices B and C.
 4. International Mechanical Code - 2009 Edition, First Printing
 5. International Plumbing Code, 2012 Edition, as amended, known as the Colorado Plumbing Code
 6. International Energy Conservation Code - 2009 Edition, First Printing
 7. National Electrical Code 2014 Edition
 8. International Existing Building Code- 2009 Edition, First Printing
- C. Comply with all requirements and codes adopted by the Fire Department, Utility Company, and Health Department having jurisdiction. Comply with all other requirements of the Public Safety Section, and any other local, state or federal requirements that are applicable.
- D. In case of a conflict between referenced applicable codes or other requirements, the one having the more stringent requirements shall govern. Where governing codes or requirements indicate that the drawings or specifications do not comply with the minimum requirements of the codes or requirements, the Contractor shall be responsible to immediately report the offending condition to the Architect. He shall then, with the Architect's approval, provide an installation that will comply with code requirements. Drawings and specifications shall be followed where they are superior to code requirements.
- #### 1.03 OSHA AND EEO COMPLIANCE
- A. The Contractor shall have sole responsibility for compliance on the job site to all applicable portions of the Occupational Safety and Health Act and compliance with the Equal Employment Opportunity Act.
- B. Protection of life, health and public welfare as it relates to the execution of the construction contract is the responsibility of the Contractor. The Owner, Architect and Architect's Consultants will not provide observation, inspection, supervision, or any comment on plans, procedures or actions employed at the project as they relate to safety of life, health, or public welfare. If conditions are imposed by the Owner which interfere with, or imply actions detrimental to safety, written notice shall be provided by the Contractor for action prior to effecting any unsafe conditions.

PART 2 – PRODUCTS

Not used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

Not for Construction

SECTION 01 42 13 REFERENCE STANDARDS AND ABBREVIATIONS

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the bid date except when a specific date is specified or when the standard is part of an applicable code which includes an edition date.
- C. When required by individual sections, obtain a copy of standard. Maintain copy at job site during the work.

1.02 RELATED REQUIREMENTS Drawing Symbols - See Drawings.

1.03 SPECIFICATION LANGUAGE EXPLANATION

- A. Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "in conformity therewith", "shall be", "as noted on the drawings", "a", "the" are intentional. Supply omitted words or phrases by inference in same manner as they are when "NOTE" occurs on Drawings. Supply words "shall be" or "shall" by inference when colon is used within sentences or phrases. Supply words "on the Drawings" by inference when "as indicated" is used with sentences or phrases.
- B. Imperative language is directed to the Contractor.
 - 1. The term "provide" used in the text is defined to mean "furnish and install complete, in place, and ready for operation and use", unless specifically indicated otherwise.
 - 2. The term "furnish" used in the text is defined to mean "supply and deliver", unless specifically indicated otherwise.
 - 3. The term "install" used in the text is defined to mean "place and fix in position, complete and ready for operation and use", unless specifically indicated otherwise.

1.04 ABBREVIATIONS

- A. Trade Associations: Reference in Contract Documents to trade associations, technical societies, recognized authorities and other institutions include following organizations, which are sometimes referred to only by corresponding abbreviations:

AA	Aluminum Association
AAMA	American Architectural Manufacturer's Association
ACI	American Concrete Institute
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMA	Acoustical Materials Association
ANSI	American National Standards Institute
APA	American Plywood Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers.
ASTM	American Society for Testing and Materials

AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
BIA	Brick Institute of America
CRSI	Concrete Reinforcing Steel Institute
FGMA	Flat Glass Marketing Association
FIA	Factory Insurance Association
FM	Factory Mutual Engineering Division
NAAMM	National Association of Architectural Metal Manufacturers
NCMA	National Concrete Masonry Association
NEC	National Electric Code (of NFPA)
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
NWMA	National Woodwork Manufacturer's Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UL	Underwriters' Laboratories, Inc.
WWPA	Western Wood Products Association

B. DRAWINGS AND SCHEDULES

The following abbreviations are commonly used on drawings and schedules. Drawings and Schedules may contain other abbreviations as listed in Specific Legends. Not all of the following abbreviations may apply to this project.

AB	Anchor Bolt	CB	Chalkboard,
ABV	Above		Carriage Bolt
ACT	Acoustical Tile	8 CB	Number Prefix Indicates
AD	Area Drain		Length in Feet
AFF	Above Finish Floor	CF	Cubic Foot
ALT	Alternate	CG	Corner Guard
ALUM	Aluminum	CI	Cast Iron
ARCH	Architect	CJ	Construction Joint,
AUD	Auditorium		Contraction Joint,
AV	Audio-Visual		Control Joint
AWP	Acoustical Wall Panel	CK	Caulk
		CLG	Ceiling
BEL	Below	CMP	Corrugated Metal Pipe
BLDG	Building	CMS	Compression Seal
BLK	Block (CMU)	CMU	Concrete Masonry Unit
BLKG	Blocking	CO	Clean Out
BM	Beam, Bench Mark	COL	Column
BO	Bottom of	CONC	Concrete
BOT	Bottom	CONST	Construction
BRK	Brick	CONT	Continues, Continuous
BRG	Bearing	CONTR	Contractor
BUR	Built-Up Roof	CORR	Corridor
		CPT	Carpet
C	Channel	CR	Classroom

CT	Ceramic Tile	FDVC	Fire Department Valve Cabinet
CTR	Counter		
CTSK	Countersink, Countersunk	FE	Fire Extinguisher
		FEC	Fire Extinguisher Cabinet
CUH	Cabinet Unit Heater	FEB	Fire Extinguisher Bracket
CY	Cubic Yard	FF	Factory Finish
		FG	Finished / Final Grade
D	Deep	FIN	Finish(ed)
DBL	Double	FLG	Flashing
DEMO	Demolish, Demolition	FLR	Floor
DF	Drinking Fountain	FND	Foundation(s)
DIA	Diameter	FO	Face of
DIM	Dimension	FOM	Face of Masonry
DR	Door	FOS	Face of Stud
DS	Downspout	FPP	Folding Panel Partition
DTL	Detail	FS	Floor Sink
DWG	Drawing, Drawings	FT	Foot, Feet
		FTG	Footing
E	East	FV	Field Verify
EA	Each		
EB	Expansion Bolt	GA	Gauge
EBL	Existing Block	GB	Grab Bar, Gypsum Board
EBR	Existing Brick	GC	General Contract(or)
EC	Existing Concrete	GCO	Grade Clean-Out
EF	Exhaust Fan	GI	Galvanized Iron
ECT	Existing Ceramic Tile	GL	Glass, Glazing
EGB	Existing Gypsum Board	GS	Gypsum Sheathing
EHD	Electric Hand Dryer	GT	Grout
EJ	Expansion Joint	GV	Galvanized
EL	Elevation		
ELEC	Electrical	H	High, Height
ELEV	Elevator	HB	Hose Bib
EMB	Equipment Mounting Board	HBD	Hardboard
		HC	Meets Requirements for Handicap Accessibility
EMER	Emergency		
EN	Enamel	HCC	Meets Requirements for Handicap Accessibility for Children
ENC	Enclose(ure)		
ENG	Engineer		
EP	Epoxy Paint	HDWR	Hardware
EPB	Electric Panel Board	HM	Hollow Metal
EPWD	Existing Plywood	HORIZ	Horizontal
EQ	Equal	HR	Hour
EQUIP	Equipment	HT	Height
ESAG	Existing Suspended Acoustical Grid Ceiling	HVAC	Heating/Ventilating/Air Conditioning
EWC	Electric Water Cooler		
EXG	Existing	ID	Inside Diameter
EXH	Exhaust	IE	Invert Elevation
EXP	Expansion	IMC	Instruction Media Center
EXT	Exterior	INCL	Include (d/ing)
		INSUL	Insulation
FA	Fire Alarm	INT	Interior
FD	Floor Drain	INV	Invert
FDN	Foundation		
		JST	Joist

JT	Joint	PRFN	Prefinished
JBE	Joist Bearing Elevation	PL	Plate
KIT	Kitchen	PLAM	Plastic Laminate
		PLAS	Plaster
L	Length, Long	PREP	Preparation
LAM	Laminate	PROV	Provide
LAV	Lavatory	PSF	Pounds Per Square Foot
LB	Lag Bolt	PSI	Pounds Per Square Inch
LF	Linear Feet	PTN	Partition
LG	Large	PVC	Polyvinylchloride
LH	Left Hand	PWD	Plywood
LLV	Long Leg Vertical	PAF	Powder Actuated Fastener(s)
LT	Light		
M	Meter	QT	Quarry Tile
MAS	Masonry		
MAT	Floor Mat	R	Radius
MATL	Material	R	Risers
MAX	Maximum	RA	Return Air
MB	Marker board, Machine Bolt	RB	Rubber Base
8 MB	Number Prefix Indicates Length in Feet	RBF	Rubber Floor
MECH	Mechanical	RD	Roof Drain
MFR	Manufacture(er)	RDL	Roof Drain Leader
MH	Manhole	REBAR	Reinforcing Bar(s)
MIN	Minimum, Minute(s)	REF	Refrigerator
MISC	Miscellaneous	REM	Remove
MO	Masonry Opening	REQD	Required
MTD	Mounted	REV	Revise (d/ion)
MTL	Metal	RFG	Roofing
MULL	Mullion	RFH	Roof Hatch
		RFL	Reflected
		RH	Right Hand
		RM	Room
N	North	RNF	Reinforce, Reinforcing
NIC	Not in Contract	RO	Rough Opening
NO	Number	ROW	Right-of-Way
NOM	Nominal	RST	Resilient Stair Tread
NRC	Noise Reduction Coefficient	RTU	Roof Top Unit
NTS	Not to Scale	RVR	Reversed
		S	South
O/	Over	SCS	Suspended Ceiling System
OA	Overall		
OC	On Center	SC	Solid Core
OD	Outside Diameter	SCHED	Schedule
OH	Overhead	SEA	Sealer
OPG	Opening	SECT	Section
OPP	Opposite	SEF	Seamless Epoxy Flooring
ORCH	Orchestra	SCS	Suspended Ceiling System
PT	Paint		
PBD	Particleboard	SF	Square Feet
PE	Porcelain Enamel	SHT	Sheet
PER	Perimeter	SHTH	Sheathing
PCJ	Precast Joint	SIM	Similar
PRFB	Prefabricated	SKL	Skylight

SLV	Short Leg Vertical
SM	Small
SNT	Sealant
SPEC(S)	Specification(s)
SQ	Square
SRF	Seamless Resin Flooring
SS	Stainless Steel
STD	Standard
STL	Steel
STO(R)	Storage
STRUCT	Structure, Structural
STS	Self-tapping Screw(s)
SUSP	Suspended, Suspension
SVCT	Slip Retardant Vinyl Composition Tile
SVF	Sheet Vinyl Flooring
SYN	Synthetic
SYS	System
T	Treads
TB	Tack board
8 TB	Prefix Number Indicates Length in Feet
TEL	Telephone
TMV	Thermostatic Mixing Valve
T&G	Tongue and Groove
THK	Thick(ness)
TO	Top of
TOW	Top of Wall
TYP	Typical
UR	Urinal
UNO	Unless Noted Otherwise
VB	Vapor Barrier
VCT	Vinyl Composition Tile
VERT	Vertical
VWF	Vinyl Wall Fabric
W	West, Wide, Width
W/	With
WC	Water Closet
WD	Wood
WDW	Window
W/O	Without
WP	Water Proofing
WR	Water Repellent (Resistant)
WWF	Welded Wire Fabric

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 45 00 QUALITY CONTROL

PART 1 - GENERAL

1.01 TESTING

- A. Owner will contract directly with accredited testing laboratory for required testing. Contractor shall provide on-site equipment and facilities required by the testing laboratory for conducting field tests, and collecting and forwarding samples.
- B. Contractor shall not use any materials or equipment represented by samples until tests, if required, has been made and the materials or equipment are found to be acceptable. Any product deemed unfit for use shall not be incorporated into the work.
- C. All materials or equipment proposed for use may be tested at any time during their preparation or use. Contractor shall furnish the required samples without charge and give sufficient notice of the placing of orders to permit testing. Products may be sampled either prior to shipment or after being received at the site of the work.
- D. Tests noted below shall be made by an accredited testing laboratory, paid by the Owner. Except as otherwise noted, sampling and testing of materials, and laboratory methods and testing equipment shall be in accordance with the latest standards of the American Society of Testing and Materials (ASTM).
- E. Where additional or specific information concerning testing methods, procedures, sample sizes, etc., is required, requirements are included under the applicable Sections of the specifications.
- F. The Contractor shall not take action or direction based on verbal or written communication by the Owner's Special Inspector. The Contractor shall rather initiate a Request for Information to the Architect of record and comply with the response of that Request for Information from the Architect of record.

1.02 CONCRETE TESTS

Control tests of concrete work shall be made at the Owner's expense at such times and number prescribed by Section 03 30 00.

1.03 FILL AND BACKFILL TESTS

Control tests of fill and backfill shall be made by the Geotechnical Engineer, contracted and paid for by the Owner. The Geotechnical Engineer will make sufficient tests to ensure that fill and backfill operations and materials comply with the requirements of Section 31 20 00.

1.04 ASPHALTIC CONCRETE PAVING

Control tests of asphaltic concrete paving shall be made at the Owner's expense by the Geotechnical Engineer. The Geotechnical Engineer will make sufficient tests to ensure that asphaltic concrete paving operations and materials comply with requirements of Section 32 12 16.

1.06 SPECIAL INSPECTIONS

Special Inspections will be required per the 2015 International Building Code. These tests will be made at the Contractor's Expense.

1.09 QUALITY CONTROL SYSTEM

- A. General: Contractor shall establish a quality control system to perform sufficient inspection and tests of all items of work, including that of all subcontractors, to ensure conformance to the Contract Documents for materials, workmanship, construction, finish, functional performance and identification. This control shall be established for all construction except where the Contract Documents provide for specific compliance tests by testing laboratories or engineers employed by the Owner. The quality control system shall specifically include all testing assigned to subcontractors by various Sections of the specifications.
- B. The quality control system shall be the means by which the Contractor is assured that the construction complies with the requirements of the Contract Documents. Control shall be adequate to cover all construction operations and should be keyed to the proposed construction schedule.
- C. Records: The Contractor shall maintain correct records on an appropriate form for all inspections and tests performed, instructions received from the Architect, and actions taken as a result of those instructions. These records shall include evidence that the required inspections or tests have been performed (including type and number of inspections or tests, nature of defects, causes for rejection, etc.) proposed or directed remedial action, and corrective action taken. The Contractor shall document inspections and tests as required by each Section of the specifications.

1.10 QUALITY CONTROL PLAN SUBMITTAL

Within sixty (60) days after Notice of Award, the Contractor shall furnish quality control plan to Architect which shall include the personnel, procedures, instructions, and records to be used. The plan shall specifically include the following:

1. A list of control tests which the Contractor understands Contractor or subcontractors are to perform.
2. Procedures for reviewing shop drawings, product data, samples or other submittals before submission to Architect. Include procedures for obtaining required field measurements.
3. Method of documenting quality control operation, inspection and testing including samples of proposed forms.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 45 27 MEASUREMENT PROTOCOLS FOR COMPLIANCE VERIFICATION

PART 1 - GENERAL

1.01 INFORMATION INCLUDED

- A. Protocols for measurement of constructed improvements
- B. Measurement Instruments/tools and required precision capabilities
- C. Correction of out-of-tolerance work

1.02 RELATED REQUIREMENTS

- A. 00 73 00 Supplementary Conditions
- B. 01 71 23 Field Engineering

1.03 GENERAL

- A. The measurement protocols specified herein shall be used to verify compliance of construction with tolerances and standards. Said protocols may include:
 - 1. Where measurements are taken
 - 2. How measurements are taken
 - 3. Number of measurements taken
 - 4. Number or percentage of measurements that must fall within limits to establish compliance
- B. The following measurement instruments and tools (collectively referred to herein as “tools”) shall be used to provide the measurements required in the protocols specified herein:
 - 1. Metal measuring tape (1/16 inch (1mm) least increment graduation)
 - 2. Straightedge: aluminum spirit level
 - 3. Digital inclinometer (SmartTool®) level
 - 4. Transit-level
 - 5. Surveyor's Plumb bob and line
 - 6. Aluminum grade rod graduated in units appropriate to the element being measured and applicable tolerance: feet, inches, eighths of an inch; or feet, tenths of a foot, and hundredths of a foot.
 - 7. Construction laser
- C. Accuracy and precision of tools and measurement technique: Tools shall be capable of the following precisions:
 - 1. Distance measurements: 1/16 inch (1 mm)
 - 2. Angular or slope measurements: 0.1 degree
 - 3. Elevation measurements: 0.01 ft. (1/8 inch or 3 mm)
 - 4. As may be otherwise required by specified standard
- D. Reading and recording measured values to the nearest graduation: If indicator is between two graduations, but closer to one graduation than it is to the other, the value of the closer graduation shall be read and recorded. In the case where, as nearly as can be determined, the indicator is midway between two graduations, the value to be read and recorded is that of the graduation whose value is even.
- E. Measurement tools for Right-of-way Construction: Measurement tools for Right-of-way construction shall be as required by the relevant jurisdictional authority, or in the absence of any such requirements, the tools otherwise specified herein.

1.04 MEASUREMENT PROTOCOLS

- A. Walk and other non-ramp pedestrian paths (collectively and hereinafter referred to as “walk(s)”): Measure for overall running slope and cross slope as well as local running slope and cross slope variations (flatness) as follows:
1. Walk running slope: Measure for overall slope (primary direction of travel) by determining elevations at the ends of the walk, noticeable changes in slope, or at a maximum of 20 ft. (6 m) intervals beginning at one end of the walking surface. Elevations shall be measured at the midpoint of the width of the walking surface. Calculate the running slope using the horizontal distance between elevation points and the difference between the elevations at those points (i.e. the “rise over run”).
 2. Walk cross slope: Measure for overall cross slope (direction perpendicular to the running slope) by establishing elevations at the outside edges of the walk surface at 10 ft. (3 m) intervals beginning at one end of the walk. Calculate the cross slope at these locations using the horizontal walk surface width and the difference between the measurement elevations at the edges of the walk (i.e. the “rise over run”). If an obvious change occurs between measuring points (such as where a steeper driveway crosses a sidewalk), measure a minimum of two cross slopes at the steeper portion, but in no case shall the measurements be farther apart than 5 ft. (1.5 m).
 3. Flatness of walk running slope:
 - a. For pedestrian walks up to and including 6 ft. (1.8 m) wide: measure for flatness of the running slope at 10 ft. (3 m) increments along the midpoint of the width of the walk by using a 10 ft. (3 m) unlevelled straightedge resting on high spots. Measure the distance between the straightedge and the surface at the largest gap. See Figure 1(a).
 - b. For pedestrian walks over 6 ft. (1.8 m) wide: Measure for flatness of the running slope at 10 ft. (3 m) increments along two paths, each 2 ft. (600 mm) from the edge of the walk/path. Using a 10 ft. (3 m) straightedge resting on high points, measure at 10 ft. (3 m) increments along the two lines. Measure the distance between the straightedge and the surface at the largest gap. See Figure 1(b).
 4. Flatness of walk cross slope: Measure flatness of the cross slope by placing a 24 inch (600 mm) digital inclinometer perpendicular to the line of travel at 10 ft. (3 m) intervals with not less than two measurements. Measure along two paths, each with the end of the digital inclinometer 1 ft. (300 mm) from the edge of the walk and placed toward the middle of the walk. See Figure 2. If the walk is less than 6 ft. (1.8 m) wide the ends of the measurement will overlap at each interval.
- B. Measurement of parking areas: This protocol applies only accessible access aisles and passenger loading zones that are part of a larger parking area. Consider a walk area with a minimum width of 60 inches and a length of approximately 20 ft. Measure overall running slope (long dimension) and cross slope (short direction) according to paragraphs 1.04.A.1 and 1.04.A.2 of this Section. See Figure 3.
- C. Horizontal gaps and vertical alignment: Measure for local horizontal discontinuities and variations in vertical alignment such as concrete joints, gaps, grade breaks, and at the interface of concrete with other materials or elements built into the surface. Measuring tools must be capable of measuring to a precision of 1/16 inch (1 mm).
- D. Ramps: Measure ramps, including curb ramps, for overall running slope and cross slope as well as local running slope and cross slope variations (flatness) as follows:
1. Ramp running slope: Measure for overall running slope of ramp by determining elevations at the top and bottom of the ramp at the midpoint of the width of each ramp run and calculate the slope using the horizontal ramp length and the difference between top and bottom elevations (i.e. the “rise over run”).
 2. Ramp cross slope: Measure for overall cross slope of ramps by establishing elevations at the extreme edges of the ramp at the top and bottom of the ramp and calculate the cross slope

- at these two locations using the horizontal ramp width and difference between elevations at the edges of the ramp (i.e. the “rise over run”).
3. Flatness of ramp running slope: Measure flatness of the running slope of ramps at 12 inch (300 mm) increments by using successive, overlapping 24 inch (600 mm) lengths using a 24 inch digital inclinometer. For each measurement, place the inclinometer such that it reads the steepest slope or spans between two high points. See Figure 4. Alternatively, measurement may be made by using a digital inclinometer mounted on a 12 inch (300 mm) beam or instrument meeting the precision requirements of paragraph 1.03.C of this Section. Make measurements at the following locations:
 - a. For ramps from 36 inches (915 mm) up to, and including, 5 ft. (1525 mm) wide between handrails, measure along two lines parallel to the length of the ramp. Each line shall be approximately 6 inches (150 mm) from the inside (ramp side) edge of the handrail. For ramps where handrails are not used, such as curb ramps, measure 6 inches (150 mm) from the edge of the ramp. See Figure 5(a).
 - b. For ramps over 5 ft. (1525 mm) in width between handrails, measure along an additional line for each additional 36 inches (915 mm) of width or fraction thereof beyond 5 ft. (1525 mm). The additional line or lines shall be spaced equidistant between the two outside measurement lines. See Figure 5 (b).
 4. Flatness of ramp cross slope: Measure flatness of cross slope by placing a 24 inch (600 mm) digital inclinometer perpendicular to the line of travel at 4 ft. (1200 mm) intervals with not less than two measurements per ramp.
 - a. For short ramps where only two measurements are made, measure cross slope at the top and bottom of the ramp. For ramps up to and including 5 ft. (1525 mm) wide between the handrails, measure cross slope in the center of the ramp. See Figure 6(a).
 - b. For ramps over 5 ft. (1525 mm) wide between handrails, measure along both handrails with one end of the digital inclinometer placed at the line used to measure running slope. See Figure 6 (b). In addition to the measurement locations already described in this paragraph 1.04.D, if a portion of the ramp appears to be steeper than 1:48 (approximately 2%), measure at that location as well.
 5. Flatness of ramp landings: Measure ramp landings at the midpoints of each landing in each direction using a 24 inch (600 mm) digital inclinometer. Edges of the ramp landing should coincide with the cross slope measurements as described in paragraph 1.04.D.2.
- E. Stairs: Measure cast-in-place stairs for both riser height and tread depth of each riser and tread as follows:
1. For stairs 60 inches (1520 mm) or less in width, measure along a line approximately 18 inches (460 mm) from the wall or outside edge of the stair.
 2. For stairs with intermediate handrails, take additional measurements approximately 15 inches (380 mm) on both sides of the intermediate handrail.
 3. Measure stair riser height as the vertical dimension between tread nosings. If a tread slopes for drainage, use a straightedge to extend the line of the upper nosing to allow measurement to the nosing below.
 4. For exterior stairs sloped from the riser to the nosing for drainage, measure the slope of each tread using a digital inclinometer placed along a line as indicated in 1.04.E.1 and 1.04.E.2 above.
- F. All other construction/improvements/elements: Measurements shall be made in accordance with practices, and using the tools, customarily used for the type of work or construction element under consideration.
- G. Measurement Protocols for Right-of-way Construction: Measurement protocols for Right-of-way construction shall be as required by the relevant jurisdictional authority, or in the absence of any such protocols, the protocols otherwise specified herein.

1.05 NONCOMPLIANT WORK – REMEDIAL ACTIONS

- A. Contractor shall promptly correct Work determined to be outside of specified tolerances, or which is unacceptable to regulatory agencies whether discovered before or after Substantial Completion. Required or necessary corrections may include total replacement, partial replacement, adjustment, moving, filling, patching, or other operations as appropriate for a given construction improvement/element. Corrected work must result in quality of construction equivalent in all respects to that originally required by the Contract Documents.

- B. In the event the Owner prefers to accept Work that is outside of specified tolerances, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

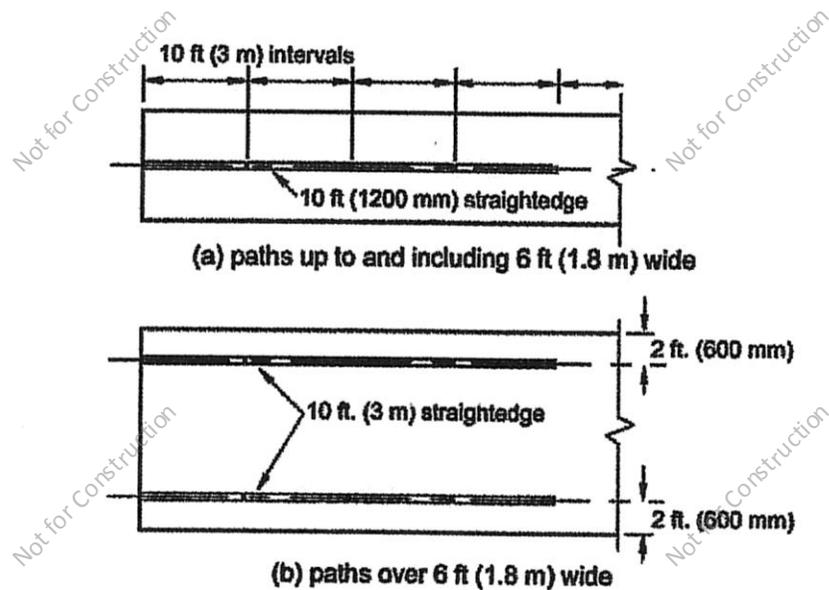


Fig. 1
Non-ramp pedestrian path flatness measurement for running slope

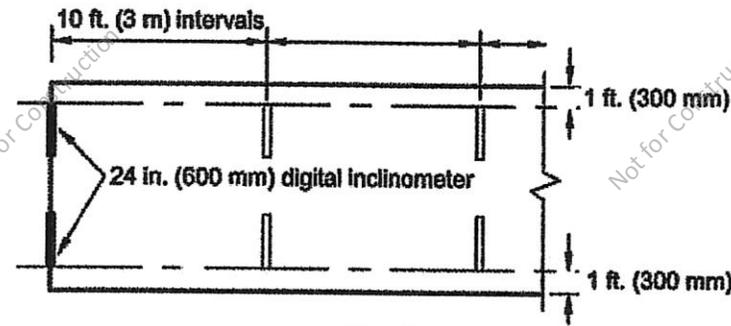


Fig. 2
Non-ramp pedestrian path flatness measurement for cross slope

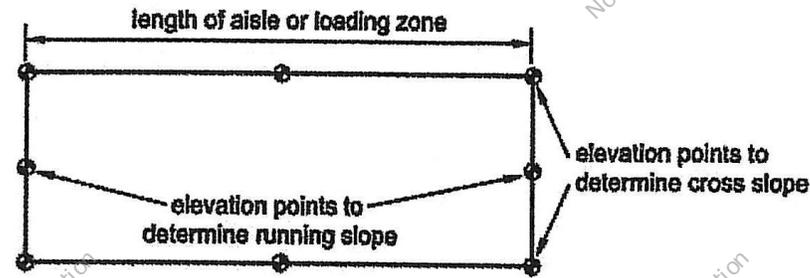


Fig. 3
Parking access aisles and passenger loading zone measurement

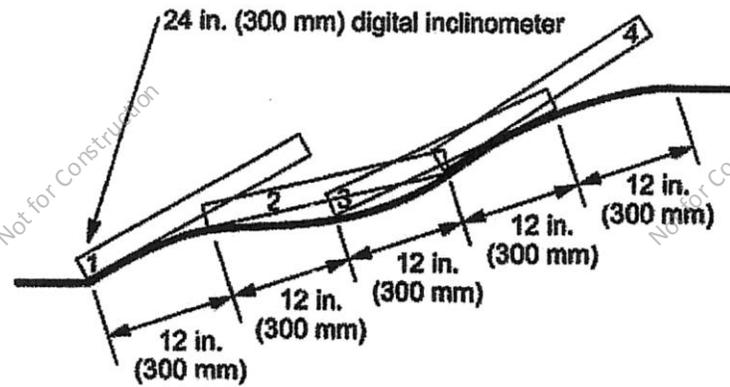


Fig. 4
Measuring local ramp slope

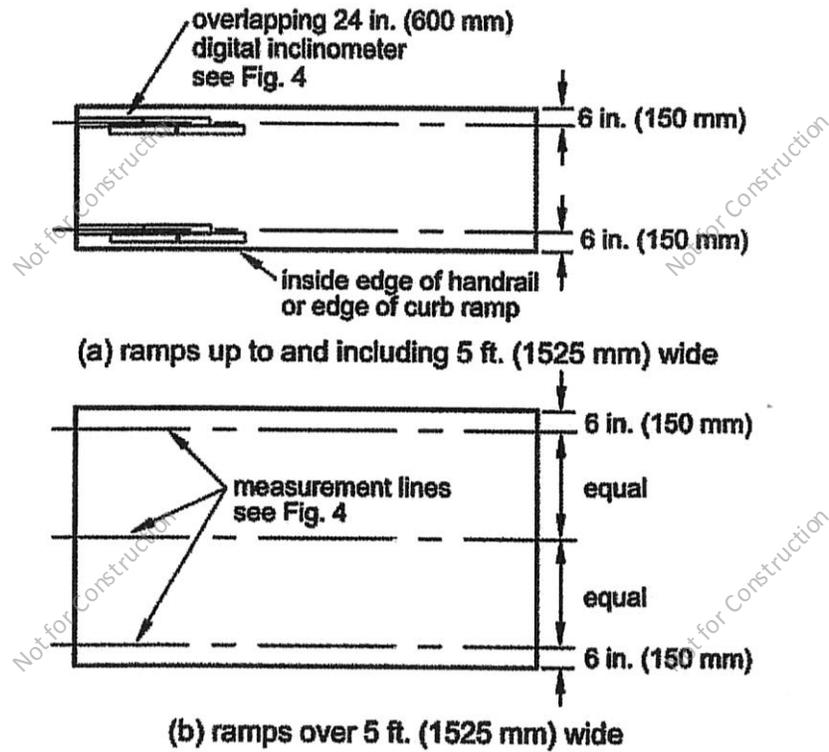


Fig. 5
Ramp flatness measurement for running slope

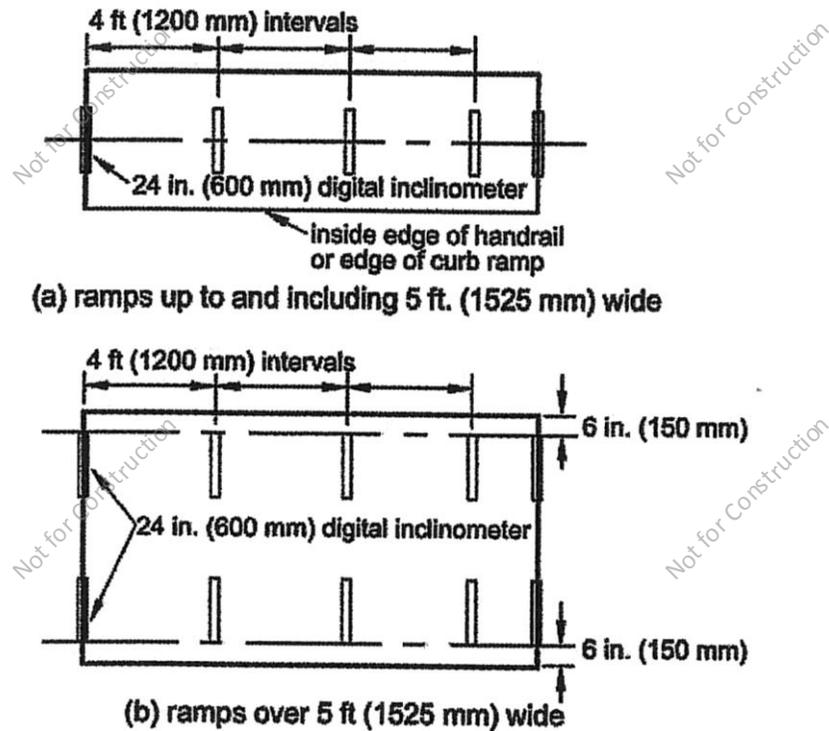


Figure 6
Ramp flatness measurement for cross slope

END OF SECTION

SECTION 01 50 10 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 TEMPORARY ELECTRICITY AND LIGHTING

A. Service and Distribution:

1. The Owner will allow temporary electrical service from the existing building. Contractor shall provide temporary wiring, outlets, lights, etc., as required for construction power and lighting during construction period. Remove all temporary wiring upon completion of work.
2. Temporary service and distribution system shall be properly grounded in accordance with the NEC. Provide ground fault interrupters as required by Code. Distribution equipment and wiring devices for temporary power and lighting need not be new; however, the installation shall conform to good safe general practice as required by the Occupational Safety and Health Administration.
3. The Contractor will pay for electricity used from the designated source.

B. Temporary Power:

1. Contractor shall provide double duplex 120V outlets. Each subcontractor shall furnish extension cords necessary to convey electricity from double duplex outlets to portions of the building in which their work is in progress.
2. Special power required for welders or other special equipment shall be provided by the trade requiring such power.
3. Planned power outages shall be scheduled with the Owner at least 48 hours in advance, and shall be done only with the Owners approval.

C. Temporary Lighting:

1. General Contractor shall provide working lights (plug-in portable lights) as required to complete their portion of the work. Temporary lighting shall be at levels as required by governing regulations but not less than the following:
 - a. Minimum of 5 foot-candle illumination in all areas accessible to workers during hours they are at the job.
 - b. Minimum of 10 foot-candles illumination for shop areas.
 - c. Minimum of 20 foot-candles illumination for where detailed or finishing work is being done, supplemented as required.
2. Contractor shall be responsible for seeing that temporary lighting is turned off at times when no work is in progress, unless required for security.

1.02 TEMPORARY HEAT AND ENCLOSURES

Contractor shall provide temporary heat necessary for the execution of the work on the project. Temporary heating apparatus shall be installed, maintained, and operated by the Contractor in a safe manner to facilitate the continuation and protection of the work. No fuel of any kind, (gas propane, etc.) shall be stored inside the building.

1. General Contractor shall provide temporary enclosures necessary for holding temporary heat such as enclosures for masonry or concrete work or for thawing frozen ground.
1. After the building is entirely permanently enclosed, glazing of exterior openings completed, permanent or temporary doors on exterior openings, and permanent heating system installed and capable of being adequately controlled, the permanent heating system may be used to provide heat for the building subject to approval of the Owner and Architect. Owner shall pay for gas and electricity used in connection with the operation of same up to the date of Substantial Completion.
2. In using the permanent heating system, Contractor shall assume complete responsibility for its proper operation and for correction of any damage that may occur to permanent heating system. Use of permanent heating system by Contractor shall in no manner compromise

the warranty of the system. Warranty of the system will commence at date set in the Certificate of Substantial Completion.

1.03 FIELD OFFICE AND OTHER TEMPORARY STRUCTURES

- A. The Contractor shall provide temporary office facilities at the site, in a location approved by the Owner.
- B. The Contractor's Field Office will not be permitted to occupy space within the existing structure or within incomplete portions of building under construction.
- C. The Contractor's field office shall be weather tight, heated and suitable for the conduct of the Contractor's business, and to conduct required construction meetings.
 - 1. The office shall be equipped with a telephone, fax machine and such other amenities as are necessary for the conduct of the Contractor's business.
 - 2. The Contractor's office equipment shall be available for reasonable use by the Architect, Owner and their consultants when conducting project business.
 - 3. Contractor shall provide a conference table and adequate number of chairs to accommodate field meetings and pre-phase meetings.

1.04 TEMPORARY TELEPHONE SERVICE

Contractor shall provide for communications to the project site by cellular telephone which shall be in the possession of the full-time Project Superintendent and shall also cause to be installed in his field office a telephone and facsimile machine for the use of himself and others engaged in the work. Contractor shall pay for the installation, maintenance, removal, and all other charges for the use of this telephone and facsimile machine.

1.05 TEMPORARY WATER

- A. Contractor shall provide temporary connections, plumbing, piping etc., necessary to convey water from existing on-site sources designated by the Owner, to places needed.
- B. The Contractor will pay for water used from the designated source. However, should the demand for water during the course of construction exceed the capacity of the designated source, the Contractor shall provide for the additional water required at his own expense and by whatever means he deems expedient.

1.06 TEMPORARY SANITARY FACILITIES

- A. Contractor shall provide and maintain, in a neat and sanitary condition, adequate chemical toilet facilities for the use of employees engaged in the work, in strict compliance with the requirements of applicable codes, regulations, laws, and ordinances.
- B. Restrooms in the existing building are not available for use during the construction period.

1.07 TEMPORARY PROTECTIVE FACILITIES

Contractor shall provide and maintain protective devices and facilities for the protection of the public and the general protection of workers on the project including, but not limited to, the following:

- 1. Danger signs warning against hazards created by such features of construction such as protruding nails, hoists, and falling materials.
- 2. Fire protection equipment. Contractor shall provide and maintain fire extinguishers and active fire hydrants where indicated, maintain fire lanes to hydrants, and provide other equipment as necessary for proper fire protection during construction. Such equipment shall be used for fire protection only.
- 3. Contractor and each subcontractor shall provide temporary walks, roadways, trench covers, barricades, bulkheads, railings, danger lights, and signals, etc., required for work by Federal, State, and Municipal safety laws and building codes.

4. Temporary protective facilities shall be maintained in good condition throughout the term of the work. At completion of the work, they shall be removed and all work damaged thereby shall be repaired and replaced to good condition.
5. Danger lights shall be kept lighted each night from sunset to sunrise.

1.08 SCAFFOLDING AND RUNWAYS

- A. Scaffolding shall be the responsibility of the trade requiring same who shall include its cost in his bid and shall be responsible for its maintenance.
- B. Contractor shall furnish, erect, and maintain runways, guard rails, platforms, and similar temporary construction, as he may deem necessary for the safe performance of the contract. Such facilities shall be of type and arrangement as required for their specific use; shall be substantially constructed throughout, strongly supported, well secured, and shall comply with applicable rules and regulations or applicable state and local codes.

1.09 CLOSURES

Contractor shall erect temporary closures over openings when weather conditions render such action necessary for proper installation of any portion of the work. Provide temporary closures at the interface of new construction and renovation areas. Provide secure noise proof and dustproof temporary partitions to allow Owner's operations to continue unimpeded in the existing building.

1.10 PROTECTION FOR WORK IN PLACE

Work in place that is subject to injury because of adjacent operations shall be covered, boarded up, or substantially enclosed with adequate protection. Permanent openings used as thoroughfares for the introduction of work and materials to the structure shall have heads, jambs, and sills well blocked and boarded. All forms of protection shall be constructed in a manner such that, upon completion, the entire work will be delivered to the Owner in undamaged condition.

1.11 ACCESS

Limit access to necessary routes to perform the work.

1.12 TEMPORARY CONTROLS

- A. General: Comply with applicable codes, ordinances, and regulations.
- B. Noise Control: Minimize noise at all times near residential areas. Equipment shall be properly muffled. Do not operate equipment after hours.
- C. Dust Control: When construction procedures result in dust that becomes a nuisance to the Owner, private property, or traffic, Contractor shall control said dust.
- D. Water Control: Provide means necessary to control flow of water at the work to prevent damage to the Owner's property and adjacent property.
- E. Debris Control: Contractor shall continually police the work area to prevent collection and scattering of debris, loosened, uncovered or caused by execution of the work. Contractor shall provide and maintain, in a neat and orderly condition, adequate trash and debris containers of sufficient size for the use of the Contractor and subcontractors on this project. Contractor shall allow and accommodate use of the trash and debris containers by the Owner's separate contractors.
- F. Pollution Control: Take extreme caution to prevent spilling or littering of water polluting substances. Do not pump foreign materials into any portion of the sanitary or storm sewer collection systems. Provide labor, equipment, and materials necessary to remedy such

pollution. No burning of debris, or any other air polluting methods or equipment, shall be allowed.

- G. Erosion Control: Provide such facilities as might be necessary to prevent erosive damage to the Owner's property or to adjacent properties and as required by Erosion Control Plan.

1.13 CLEAN-UP DURING CONSTRUCTION

- A. Clean-Up During Construction: Contractor shall keep the building and premises free from surplus material, waste material, dirt and rubbish caused by the work. At the completion of work, Contractor shall remove surplus material, waste material, dirt and rubbish, tools, equipment, scaffolding, and shall leave the project premises clean.
- B. Contractor shall perform clean-up daily and transport rubbish to an on-site trash and debris container as described in Article 1.13 at a location designated by Contractor, who shall arrange for its maintenance and removal.
- C. Upon completion and before being accepted by the Owner, the entire work inside and out, along with the entire premises shall be in first-class, clean condition.

1.14 TREE PROTECTION

Provide snow fencing or other acceptable material around existing trees and shrubs indicated on the Drawings.

1.15 FIRE PROTECTION

If operations of Contractor require the building fire alarm or sprinkler systems to be disabled at any time during construction period, a fire guard shall be provided by the Contractor for the length of time that the fire alarm or sprinkler systems are disabled. Fire guard shall monitor the building continuously (24 hours / day) and report extraordinary events to Owner. Coordinate fire guard set up and responsibilities with Owner.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 56 39 TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Protect existing trees and plants in or adjacent to construction areas indicated to remain as specified in this Section.
2. Replace, or suitably repair, trees and plants which are damaged or destroyed due to construction operations.

B. Related Sections:

1. Earthwork: Section 31 20 00

PART 2 - PRODUCTS

2.01 MATERIALS

Barricades: Type as appropriate to serve required purpose and acceptable to the Architect.

PART 3 - EXECUTION

3.01 TREE AND PLANT PROTECTION

A. General: Preserve and protect existing trees and plants at site which are designated to remain.

B. Barriers: Provide temporary barriers to height of four feet, around each tree or group of trees and plants at drip line.

C. Trimming: Consult with Architect, and trim agreed on roots and branches which interfere with construction.

1. Employ qualified tree surgeon to remove, and to treat cuts.
2. Trim under Architect's direction.
3. Do not cut roots greater than 1" in diameter without advance notice to Architect.
4. Cut close to boles in manner that tree will present balanced appearance.
5. Treat scars resulting from removal of branches with application of rubbing alcohol.

D. Root Systems: Maintain natural cover of duff around root systems. Replace duff if necessary.

E. Stockpiles: Place stockpiles of material so that they will not slough off onto root systems of existing trees.

F. Contaminates: Dispose of solvents, oils and other materials which may be harmful to plant life in containers and remove from site. Remove and replace contaminated soil with good soil at completion of work.

G. Areas Under Trees: Within drip line of existing trees to remain:

1. Do not allow vehicular traffic or parking.
2. Do not store materials or products.
3. Prevent dumping of refuse or chemically injurious materials or liquids.
4. Prevent puddling or continuous running water.
5. Do not leave diesel or gasoline equipment running.

H. Protection: Carefully supervise construction operations, to prevent damage to plant materials. Protect against breaking and skinning of roots and skinning and bruising of bark.

3.02 REPLACEMENT

- A. General: Be responsible for care and preservation of existing trees and other plant material that are indicated to remain.

- B. Replace, or suitably repair, trees designed to remain which are damaged or destroyed due to construction operations.
 - 1. Architect will determine repair and replacement requirements.
 - 2. For trees impossible to replace, Architect will place value on units based on latest edition of "Guide for Establishing Values of Trees and Other Plants" prepared by Council of Tree and Landscape Appraisers.

END OF SECTION

SECTION 01 60 00 MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

General and Supplementary Conditions.

1.02 PRODUCTS

- A. Products include material, equipment and systems.
- B. Comply with Specifications and referenced standards as minimum requirements.
 - 1. Manufacturers and systems listed within a specification section are acceptable subject to their fully meeting the detailed requirements of that particular section.**
- C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.
- D. No asbestos containing materials will be incorporated into project. See Section 01 77 00.

1.03 TRANSPORTATION AND HANDLING

- A. Transport and handle products by methods to prevent soiling or damage.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.04 STORAGE AND PROTECTION

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well drained area; prevent mixing with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.
- E. After installation, provide coverings, to protect products from damage from traffic and construction operations, remove when no longer needed.

1.05 PRODUCTS LIST

- A. Within ten (10) days following Notice of Award, transmit three (3) copies of a list of major products which are proposed for installation, including name of manufacturer and supplier.
- B. Tabulate products by Specification Section number, title and Article number.
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

- D. Architect will promptly reply in writing stating whether there is reasonable objection to listed items. Failure to object to a listed item shall not constitute a waiver of requirements of Contract Documents.

1.06 PRODUCT OPTIONS

- A. Products are primarily specified, listed, named, noted, scheduled, or otherwise designated (collectively "specified") in specification Sections in the Project Manual, but in certain instances may be specified on the Drawings (e.g., in schedules of mechanical or electrical equipment).
- B. Products are generally specified by reference standard and/or manufacturer's name/trade name and product name, model number, catalog number, or other specific product identifier (collectively, "identifier").
- C. Products specified by naming a manufacturer and corresponding identifier, together with all other specified requirements, options, properties and characteristics constitute "Basis-of-Design" products. In some cases, Basis-of-Design products may be specifically designated as such in a given specification Section. Products approved via Request for Substitution or Prior Approval process/procedure are not Basis-of-Design products.
- D. Products specified only by reference standard(s) or by description: Provide any manufacturer's product meeting said standard(s) or description.
- E. Products specified by listing one or more manufacturers with a provision for substitution (e.g., "approved substitute", or phrase of equivalent meaning): Provide product(s) by listed manufacturer meeting specified requirements. Request for Substitution may be submitted for any manufacturer/product not specifically listed, subject to the limitations described herein.
- F. Products specified by listing one or more manufacturers without a provision for substitution: Provide product(s) by listed manufacturer meeting specified requirements, no substitutes.
- G. **Notwithstanding any other provision of the Contract Documents, all costs and fees (redesign costs) for making modifications, e.g., architectural, civil, structural, mechanical, electrical, etc., to the Contract Documents, as well as all costs pertaining to construction of the Work, made necessary by selection/provision of products other than Basis-of-Design products, shall be the responsibility of the Contractor, and no increase in the Construction Contract Amount will be made on account thereof. Contractor shall reimburse Owner for said redesign costs via deductive change order.**

1.07 LIMITATIONS ON SUBSTITUTIONS

- A. During the bidding period, provisions of 01 11 13/Summary of Work, Article 1.06 establish the time frame and other conditions (Prior Approval process) under which Request for Substitution may be submitted.
- B. Notwithstanding other provisions of this Section, Request for Substitution will be considered if the specified product (considering all listed product options) becomes unavailable for reasons beyond the Contractor's control.
- C. Up to and including thirty (30) days after Award of Contract, Request for Substitution will only be considered for one or more of the following reasons:
 - 1. Substitution will provide significantly improved quality.
 - 2. Substitution will provide significant improvement in Project Schedule.
 - 3. Substitution will result in significant savings to the Owner. All benefit of cost reduction must go to the Owner. Evaluation of cost will be based upon initial cost only.

- D. Substitutions will not be considered:
1. When made more than thirty (30) days after Award of Contract.
 2. When requested via requests for interpretation/information (RFI).
 3. When requested, indicated or implied on Shop Drawings, in Product Data, or other such submittals.
 4. Without a separate, formal request that is in full compliance with other requirements specified herein.
 5. When requested or submitted directly to Architect by subcontractor or supplier.
 6. When acceptance will require substantial revision of Contract Documents.
 7. If acceptance will require an increase in the Contract Amount.
- E. Request(s) for Substitution must include a written statement of cause for request and provide substantiating documents; shall be accompanied by a detailed written, point-by-point comparison between the specified item and the proposed substitute item. Request(s) for Substitution shall be accompanied by complete technical data, including laboratory reports, if applicable, on the proposed product. Each item proposed for substitution shall be clearly identified. Submit listing of local installations where proposed products have been provided, include names and phone numbers of references familiar with installation and proposed product's performance. Fully explain all variations/differences, between the proposed product and the Basis-of-Design product named in the Specifications, e.g., cost and date by which proposed product can be delivered to Project.
- F. Substitute products shall not be ordered or installed without written approval of Request for Substitution having been properly issued to Contractor.
- G. Only one (1) Request for Substitution for any product will be considered. If a substitution is not approved, provide specified product.
- H. Architect will be the sole judge of acceptability of proposed/requested substitutions.
- 1.08 CONTRACTOR REPRESENTATION
- A. Request for Substitution constitutes a representation that Contractor has investigated proposed product and has determined that it is equal to or superior in all respects to specified product and that it will coordinate properly with the Work.
- B. Contractor will provide same warranty for substitution as for specified product.
- C. Contractor will coordinate installation with all other affected products and systems, and will make any and all necessary changes as may be required for Work to be complete in all respects.
- D. Contractor waives claims for additional costs that may become apparent subsequent to approval of a Request for Substitution.
- E. Should it be discovered that any information/data about any proposed substitute product in a Request for Substitution was false, mis-stated or otherwise inaccurate, whether before, during or after incorporation into the Work, the Contractor shall, at no additional cost to the Owner, replace said substitute product with the product originally specified.
- 1.09 COORDINATION OF OPTIONS AND SUBSTITUTIONS
- A. Contractor must review proposals, requests and submittals by subcontractors and suppliers to ensure compliance with Contract Documents, and particularly to verify compatibility with the work and products to be provided by other trades.

PART 2 - PRODUCTS

PART 3 – EXECUTION

Not Used.

END OF SECTION

Not for Construction

SECTION 01 71 23 FIELD ENGINEERING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Field engineering services required for proper execution and completion of Work.
1. Layout (horizontal and vertical positioning) of site improvements/fixed works and right-of-way construction.
 2. Verification of position (horizontal and vertical position) of site improvements/fixed works and right-of- way construction.
- B. Related Sections:
1. Section 01 11 13: Summary of the Work
 2. Section 01 32 13: Construction Schedule
 3. Section 01 33 00: Submittals
 4. Section 01 77 00: Contract Closeout Requirements
 5. Section 31 20 00: Earth Moving
 6. Section 32 16 00: Site Concrete
- C. Definitions of selected terms and phrases:
1. Rough Grade: elevation of cut or built-up earth/soil/rock (hereinafter referred to as "earth") surface calculated and prepared to provide construction conforming to material thicknesses/dimensions and sub grade or finish grade elevation indicated for that point.
 2. Subgrade: elevation of a substrate (i.e., aggregate base course, gravel, crusher fines, sand, earth or other construction material occurring immediately below the final surface material) surface at a given location.
 3. Finish (final) Grade: elevation of any final surface (i.e., lawn, paved area, field, and the like) which has been cut, built-up or constructed to the elevation indicated for that point.
 4. Without limiting the generality of the terms "site improvements" or "fixed works", the following shall be included:
 - a. Buildings
 - b. Unoccupied structures (such as storage buildings, utility enclosures, and pump houses)
 - c. Detached shade or weather protection structures and the like
 - d. Foundations (drilled piers, piles, footings, foundation walls, etc.)
 - e. Streets, roads, driveways, driveway entrances, parking lots, curbs, gutters
 - f. Sidewalks, ramps and stairs
 - g. Retaining walls
 - h. Free-standing walls and signs (other than traffic control signs)
 - i. Fences
 - j. Street and/or site lights (when dimensioned or otherwise specifically located on drawings)
 - k. Utility lines and components
 - l. Cut or built-up earth
 - m. Permanent and temporary detention ponds and drainage ways
 - n. Fire hydrants
 - o. Drainage structures (such as manholes, inlets, catch basins, drains, and headwalls)
 - p. Landscape furniture or features (when dimensioned or otherwise specifically located on drawings).
 5. Right-of-way construction: Sidewalks, curbs and gutters, curb ramps, drive entrances/exits fire hydrants, and other structures and elements that are accessible by the public outside the borders of the project site and are part of the required Work.

1.02 REFERENCES

- A. Model Standards of Practice (Gaithersburg, MD: National Society of Professional Surveyors, latest edition)
- B. ISO 4463-1, Measurement Methods for Buildings – Setting Out and Measurement – Part 1: Planning and Organization, Measuring Procedures, Acceptance Criteria, November 1 (Geneva, Switzerland: International Organization for Standardization, 1989).
- C. NIST Handbook 44-2003, Section 5.52 (Gaithersburg, MD: National Institute of Standards and Technology).
- D. ACI 117 Specifications for Tolerances for Concrete Construction and Materials and Commentary (Farmington Hills, MidAmerican Concrete Institute, latest edition).
- E. Accessible Rights-of-way: A Design Guide, November (Washington, DC: US Architectural and Transportation Barriers Compliance Board, 1999).
- F. Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines, July 23 (Washington, DC: US Architectural and Transportation Barriers Compliance Board, 2004).
- G. UFGS Section 02730, Earthwork. United Facilities Guide Specifications, latest edition. (Washington, DC: National Institute of Building Sciences).
- H. Landscape Specification Guidelines, latest edition. (Rockville, MD: Landscape Contractor's Association).

1.03 QUALITY ASSURANCE

- A. Layout of all site improvements/fixed works and staking for excavation and grading shall be accomplished by a Surveyor (professional engineer or land surveyor licensed in the State of Colorado). Surveyor shall be hired by, or in the employ of, the Contractor.
- B. Verification of horizontal position of building(s) and other fixed works: A horizontal control plan is included in the Contract Documents which locates the building(s) and various other site fixed works. In the event a discrepancy exists, notify the Architect immediately and await further direction before proceeding with the work.
- C. Surveyor shall be responsible for (1) establishing and verifying location of all site improvements/fixed works, excavation, and grading, and (2) surveying and recording positional data for a sufficient number of points (as determined by Surveyor) to demonstrate that the Work complies with intent of the Contract Documents and to enable execution of certification(s) pertaining to same as specified elsewhere in this specification Section.
- D. All other layout shall be the responsibility of the Contractor's employees, individual subcontractors, or Surveyor to the extent, and as determined by, the Contractor.

1.04 SURVEY CONTROLS

- A. Vertical control shall use same benchmark used in the preparation of Owner's Site Survey.
- B. Horizontal control for existing improvements shall be the property line.

1.05 LAYOUT OF WORK

- A. Before commencement of the Work, Surveyor shall locate all reference points and benchmarks to be used for vertical and horizontal control.

- B. Surveyor shall lay out entire Work, set grades, lines, levels, control points, elevations, grids and positions.

1.06 RECORD DOCUMENTS

- A. Maintain complete and accurate log of all control and survey documentation as the work progresses.
- B. Record Drawings: Record, by coordinates, all utilities on-site with top of pipe elevations, at major grade and alignment changes, rim, grate or top of curb and flow line elevations of all drainage structures and sewer manholes.
- C. Indicate reference and control points on Record Drawings. Basis of elevation shall be one of the established benchmarks.

1.07 SUBMITTALS

- A. Surveyor: Submit name and address of Surveyor before beginning work at the site.
- B. Documentation and Records: Surveyor shall maintain a complete and accurate log of all controls and survey work as it progresses. On request of the Architect, submit documentation of all field engineering work.
- C. As-constructed Site Survey and final certification: Upon Completion of the Work, Surveyor shall survey the site to verify compliance with Contract Documents. Submit to Architect, two copies of said survey which shall (1) be certified as correct, (2) include the following unmodified certification statement: "All site improvements/fixes have been constructed (within specified positional tolerances) to the lines, finish grades, elevations, slopes and horizontal positions required by the Contract Documents" Said certification statement and survey shall bear the original signature and seal of the Surveyor, and original counter-signature of the Contractor.

1.08 OWNER'S SITE SURVEYS

- A. Three sets of the survey referenced in Document 00 31 19, which has been prepared by the Owner, will be provided to the Contractor for use on this project.
- B. The above data is offered solely for reference and is not to be considered a part of the Contract Documents. The data contained in the above documents prepared for the Owner by its separate consultant is believed to be reliable; however, neither the Owner nor Architect guarantees its accuracy or completeness.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

- A. Contact underground utilities location service before commencing excavation. Pre-mark areas of excavation in accordance with requirements of locator service.
- B. Establish all horizontal and vertical reference points used in the Contract Documents according to existing field conditions, before commencing work.
- C. Preserve established reference lines and benchmarks.
- D. Differentiate Project and city datum as applicable.

- E. Relocate bench marks that may interfere with Work.
- F. Reset and re-establish reference marks damaged or lost during construction.

3.02 GENERAL REQUIREMENTS

- A. Immediately upon entering the project, locate and maintain bench marks and all other grades, lines, levels and dimensions. Report any errors or inconsistencies to Architect before commencing work. Establish a minimum of two permanent horizontal and vertical control points on site, remote from construction area, referenced to data established by control points.
- B. Indicate reference points, relative to benchmark elevation, on Record Drawings.
- C. Batter Boards and Levels: Stake out the building providing rigidly set batter boards. Such batter boards shall continue in use free to all requiring them, but Surveyor and Contractor shall remain responsible for their maintenance and accuracy.
- D. Provide grade stakes and elevations to construct over-excavation and recompaction, rough and finish grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required or necessary.
- E. Calculate and layout finish elevations and intermediate controls as required to provide smooth transitions between spot elevations or finish contour lines.
- F. Provide stakes and elevations for grading, fill, and topsoil placement.
- G. Survey and record top of curb and flow line elevations on finished surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), back of curbs, grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.
- H. Provide horizontal and vertical control for batter boards for drainage, utility, and other site Improvements as required or necessary.
- I. Provide building corner offsets as required to adequately locate building pad(s). Provide cut and fill stakes within building pad perimeter adequate to control both over excavation and recompaction as-well-as final sub-grade elevation of building pad(s).
- J. Mark boundaries for rights-of-way dedications and easements for utilities prior to establishing location of site improvements.
- K. Layout all lines, elevations and measurements needed for construction or installation of all site improvements/fixes works:
 - 1. Identify site boundary, property lines.
 - 2. Provide working benchmarks.
 - 3. Set stakes for Bottom of Excavated Plane (B.E.P.)
 - 4. Set gridlines, radii, working points etc., for foundation.
 - 5. Set and verify building pad elevations.
 - 6. Set finish floor elevation(s).
 - 7. Stake horizontal locations and elevations for exterior ramps and stairs.
 - 8. Set gridlines, radii, working points, etc., for all floors of multi-story buildings.
 - 9. Set storm drain and sanitary sewer inverts and other utilities as needed, off-set from building lines.
 - 10. For new facilities, establish permanent on-site benchmark with 2" diameter brass disk.

- L. Preservation of Monuments and Stakes: Carefully preserve all monuments, bench marks, property markers, reference points, and stakes. Permanent monuments or bench marks that must be removed or disturbed shall be protected until properly referenced for relocation. Contractor shall be responsible for proper replacement of such monuments or bench marks.
- M. Layout and Control: Surveyor shall (1) establish all lines and levels, locate and layout by instrumentation and similar means all stakes for rough and finish grading and utilities layout, and (2) Set all control stakes and reset stakes as required during progress of the work.

3.03 ADDITIONAL REQUIREMENTS FOR EARTHWORK AND PAVEMENTS

- A. Provide a minimum of two permanent horizontal and vertical control points on-site, remote from building area, referenced to data established by survey control points.

3.04 ADDITIONAL SURVEY REQUIREMENTS FOR UTILITIES

- A. Provide adequate horizontal and vertical control to locate/position utility lines, including but not necessarily limited to storm sewers, sanitary sewers, water lines, gas, electric and signal lines.
- B. Locate "wet" utility lines and provide vertical control proportionate to slope of line as required for accurate construction.
- C. Dry utilities shall be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations.
- D. Survey and record invert and flow line elevations prior to trenches being back-filled.
- E. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site utility structures as required. Set grades for vault(s) one inch higher than adjacent surrounding design grades, unless specifically indicated otherwise on drawings.

3.05 CONSTRUCTION LAYOUT TOLERANCES: ON-SITE ELEMENTS

<u>ELEMENT</u>	<u>HORIZONTAL</u>	<u>VERTICAL</u>
Building offset stakes	±0.03' (±10 mm)	±0.03' (±10 mm)
Sewer offset stakes	±0.10' (±30 mm)	±0.03' (±10 mm)
Waterline offset stakes	±0.10' (±30 mm)	±0.10' (±30 mm)
Gas line offset stakes	±0.10' (±30 mm)	±0.10' (±30 mm)
Electric line offset stakes	±0.10' (±30 mm)	±0.10' (±30 mm)
Hydrant offset stakes	±0.10' (±30 mm)	±0.10' (±30 mm)
Pole-mounted site lights	±0.20' (±60 mm)	±0.20' (±60 mm)
Curb offset stakes	±0.05' (±15 mm)	±0.05' (±15 mm)

3.06 POSITIONAL TOLERANCES: ON-SITE FIXED WORK

- A. Horizontal position, any element:
 - 1. Site work distances (L) up to 13' (4 m): ±0.03' (±10 mm)
 - 2. Site work distances (L) over 13': ±0.1087L^{1/2} inches
- B. Vertical position:
 - 1. Subgrade: ± 0.05' (15mm)
 - 2. Finish grade:
 - a. Building floor slabs on grade: ± 0.02' (6mm)
 - b. Exterior concrete or asphalt surfaces: ± 0.04' (13mm)
 - c. Concrete curb & gutter: ± 0.04' (13mm)

d. Landscape beds:	± 0.05' (15mm)
e. Sodded/seeded areas:	± 0.10' (30mm)
f. Gravel surfaces:	± 0.10' (30mm)
g. Sidewalk running slope	+1%
h. Sidewalk cross slope	+0.5%
i. Flatness (smoothness) of sidewalks	± 1/4"/10' (±6 mm/3m)
j. Curb ramp slope, main ramp	+0.5%
k. Curb ramp, flare slope	+0.5%
l. Curb ramp gutter counter slope	+0.5%
m. Widths of sidewalks and other paving	± 3/4" (±19 mm)
n. Elevation points of construction	± 1/2" (±13 mm)
o. Concrete joint size	+ 1/8" (+3 mm)
p. Concrete stairs (riser)	± 1/8" (±3 mm)
q. Concrete stairs (tread)	± 1/4" (±6 mm)
r. Placement of detectable warning surfaces	± 3/4" (±19 mm)
s. Installation of metal handrails and guardrails	± 1/2" (±13 mm)
t. Horizontal placement of poles, controls, signs, & the like	±2" (±50 mm)
u. Vertical placement of controls, signs & the like	±1" (±25 mm)
v. Vertical placement of handrails	None for handrail height
w. Asphalt elevation points of construction	± 1/2" (±13 mm)
x. Change of level	+1/8" (+3 mm)

C. Determination of compliance: tolerances stated herein are not additive with each other or any other tolerance.

D. All tolerances listed in this Article 3.06 are in addition to, and not in lieu of, any other tolerances referenced or specified in any other specification Section or Contract Document.

3.07 POSITIONAL TOLERANCES: OFF-SITE FIXED WORK

Tolerances for all required off-site right-of-way construction shall be as required by the jurisdiction having authority over same. If said jurisdictional authority does not enforce a tolerance for a given element, the relevant tolerance(s) listed in Articles 3.05 and 3.06 shall apply.

END OF SECTION

SECTION 01 73 29 CUTTING AND PATCHING

PART 1 - GENERAL

1.01 DESCRIPTION

Work Included: Contractor shall be responsible for all cutting, fitting and patching including related excavation and backfill, required to complete the work or to:

1. Make its parts fit together properly.
2. Uncover portions of the work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to requirements of Contract Documents.
5. Remove samples of installed work as specified for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
7. Install piping or conduit under existing concrete floors on grade or in existing walls.
8. Cut and patch existing paving at all new cuts for electrical or piped utilities.
9. Remove and replace undesignated areas of partitions, walls, ceilings, etc., necessary for installation of new mechanical and/or electrical work.
10. Install piping or conduit under existing concrete floors on grade or in existing walls.
11. Cut and patch existing paving at all new cuts for electrical or piped utilities.
12. Remove and replace undesignated areas of partitions, walls, ceilings, etc., necessary for installation of new mechanical and/or electrical work.

1.02 QUALITY ASSURANCE

Notification of Architect: Notify Architect well in advance of executing any cutting or alteration which affects:

1. The work of the Owner or any separate contractor.
2. The structural value or integrity of any element to the Project.
3. The integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
4. The efficiency, operational life, maintenance or safety of operational elements.
5. The visual qualities of sight-exposed elements.

PART 2 - PRODUCTS

2.01 MATERIALS

Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.01 EXAMINATION

Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work. Report unsatisfactory or questionable conditions to the Architect; do not proceed with the work until the Architect has provided further instructions.

3.02 PREPARATION

Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work. Provide devices and methods to protect other portions of the project from damage. Provide protection from the elements for that portion of the project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 CUTTING AND PATCHING

- A. General: Openings in construction which are required by the work shall be left by trade involved. It is the responsibility of the contractor to supply or obtain in advance, proper and sufficiently detailed information required for openings.
- B. Cutting: Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation or repairs. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Employ the installer or fabricator of work on this project to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Cut asphalt, concrete or masonry using a saw or core drill as applicable. Pneumatic impact tools will not be allowed unless approved by Architect.
- E. Fitting: Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- F. Patching: Wherever any pipe, conduit, duct, steel member, bracket, equipment, or other material penetrates or passes through fire-resistant wall, ceiling or floor, completely seal voids with fire stop system as specified in Section 07 84 00.
- G. Finishing: Where surfaces are exposed, finish with same materials specified in finish schedule or material that is on constructed surfaces.
- H. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish the entire unit.

END OF SECTION

SECTION 01 74 23 FINAL CLEANING

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

Construction Facilities & Temporary Controls: Section 01 50 00

1.02 CLEANERS

Cleaners: With the exception of clean-up of the site and cleaning specifically assigned to contractors under the various sections of the Specifications, all final clean-up of exterior and interior of the building shall be done by professional cleaners.

1.03 FINAL CLEAN-UP

- A. Exterior: In addition to items specified below, all surfaces on exterior, concrete, metal, etc., shall be carefully and thoroughly cleaned.
- B. Glass: Both sides of all glass shall be carefully and thoroughly cleaned by professional window cleaners and left absolutely clean and free from paint, labels, grease, dirt, etc.
- C. Hardware: Clean and polish hardware and leave clean and free from paint, grease, dirt, etc.
- D. Plumbing: Clean and polish all plumbing fixtures, fittings and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove all labels.
- E. Electrical: Clean and polish all electric fixtures, including glassware, switch plates, etc., and leave clean from paint grease, dirt, etc.
- F. Equipment: Carefully and thoroughly clean all items of equipment, mechanical, electrical, cabinets, ductwork, etc.
- G. Floors: Thoroughly clean floors. Mop resilient floor coverings as recommended by manufacturer of tile and adhesive, then thoroughly machine buff. Vacuum and clean carpeting. Damp mop or scrub concrete floors as required to leave them thoroughly clean when building is turned over to the Owner.
- H. Ceramic Tile: Remove grout haze, observing tile manufacturer's recommendations. Rinse tile work thoroughly with clean water.
- I. Painted Walls: Clean dirt, marks, smudges etc. from painted walls using only products and procedures (typically soap and water, no chemical cleaners) that are approved by the paint manufacturer. Contractor use of harsh chemical cleaners may damage paint finish, and necessitate the repainting of entire wall surface.

1.04 COMPLETION

The entire work inside and out, and the entire premises shall be in first-class, clean condition upon completion before being accepted by the Owner.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 01 77 00 CONTRACT CLOSEOUT REQUIREMENTS, INTERMEDIATE AND FINAL

PART 1 - GENERAL

1.01 PROJECT RECORD DOCUMENTS

- A. Job Site Documents: Maintain at the job site, one (1) record copy of the following:
1. Drawings
 2. Project Manual
 3. Addenda
 4. Reviewed and Accepted Shop Drawings and Product Data Submittals
 5. Change Orders
 6. Other Modifications to Contract
 7. Field Test Records
- B. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible condition, apart from documents used for construction.
- C. Record Information: Label each record document "Project Record" in 2" high printed letters. Mark all information with contrasting color using indelible ink. Keep each record current. Do not permanently conceal any work until required information is recorded.
- D. Record following information on the Record Drawings:
1. Location of all new exterior underground utility lines
 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure
 3. Field changes of dimension and detail
 4. Changes by addendum, change order, or field order
 5. Details not on original contract drawings
- E. Record following information in the Record Project Manual:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment in each section actually installed
 2. Changes by addendum, change order, or field order
 3. Other matters not originally specified
- F. Maintain Shop Drawings / Product Data Submittals as record documents: Record changes made after review by all parties.

1.02 COMPLETION OF STRUCTURAL ELEMENTS

Contractor shall notify the Architect, in writing, when substantial completion of the structural elements of the project have been achieved and request an observation by the Structural Engineer. The Architect, upon receipt of notification, will contact the Structural Engineer to schedule the observation. The observation and verification of substantial completion of the structural elements must occur before the Architect will certify payment of structural line items listed in the Contractor's Application for Payment.

1.03 COMPLETION OF SITE UTILITIES AND DRAINAGE

Contractor shall notify the Architect, in writing, when substantial completion of the site utilities and drainage elements of the project have been achieved and request an observation by the Civil Engineer. The Architect, upon receipt of notification, will contact the Civil Engineer to schedule the observation. The observation and verification of substantial completion of the referenced elements must occur before the Architect will certify payment of site utility and drainage line items listed in the Contractor's Application for Payment.

1.04 SUBSTANTIAL COMPLETION

- A. Preparation: Contractor shall submit written certification that project, or designated portion of project, is substantially complete and request a Punch List Observation by the Architect. Attached to said request shall be the Contractor's own Punch List describing incomplete work or work requiring correction.
- B. Observation: Upon receipt of the Contractor's request for Punch List Observation, the Architect will visit the site for purposes of determining Substantial Completion.
- C. Should the Architect determine that the work is substantially complete, he will prepare, if necessary, a Punch List of deficiencies in addition to those listed on the Contractor's Punch List that need to be corrected before Final Observation. The Architect may then issue a Certificate of Substantial Completion with the deficiencies noted.
- D. Should the Architect determine that the work is not substantially complete, he will notify the Contractor, in writing, stating reasons. After Contractor completes work, he shall resubmit certification and request for Punch List Observation.

1.05 REINSPECTION FEES

Should the Contractor fail to complete and/or correct all punch list items such that additional inspections are required by the Architect, the Contractor will be billed at \$100.00 per hour plus mileage and per diem for the Architect's additional services. If the Contractor has any questions with regards to any item on the punch list, he is to request clarification before final inspection.

1.06 FINAL OBSERVATION AND ACCEPTANCE

- A. Preparation: Prior to the Final Observation by the Architect, the Contractor shall submit written certification that:
 - 1. Project has been inspected for compliance with Contract Documents.
 - 2. Work has been completed in accordance with Contract Documents.
 - 3. Equipment and systems have been tested in the presence of Owner's Representative and are operational.
 - 4. Project is completed and ready for Final Observation.
- B. Observation: After receipt of written certification that project is complete, the Architect shall visit the site for purposes of determining final completion of the work.

1.07 CONTRACT CLOSEOUT SUBMITTALS

- A. See Supplementary Conditions.
- B. Evidence of Payments and Release of Liens:
 - 1. Affidavit of Payment of Debts and Claims: AIA G706.
 - 2. Affidavit of Release of Liens: AIA G706A.
 - 3. Consent of Surety to Final Payment: AIA G707.
- E. Inspection Certificates: Each subcontractor shall, upon completion of the work, secure in triplicate all certificates from any State or local governing body having jurisdiction in dictating that the work is in strict accordance with applicable codes and deliver same to the Contractor for transmittal to the Architect.
- F. Spare Parts and Materials: As specified in individual Sections. Deliver to Owner stating amounts of materials delivered (number of gallons, cases, etc.). Provide evidence of delivery to Owner by signed receipt.

- G. Miscellaneous Keys, Switches, Etc.: At the completion of the Project, all loose keys for hose bibs, adjustment keys and wrenches for door closers and panic hardware, keys for electric switches, electrical panels, etc., shall be accounted for, labeled, and turned over to the Owner. Provide evidence of delivery to Owner by signed receipt.
 - H. Sales and Use Tax Certificates. Refer to Document 00 72 00, 3.6 Taxes.
 - I. Asbestos Containing Material: Provide a letter certifying that to the best of Contractor's knowledge and belief, no asbestos containing materials have been incorporated into this project.
 - 1. A copy of this letter shall be provided to the Health Department at the time of Health Department Final Inspection.
 - J. Record Documents: At completion of project, deliver Record Documents (as defined in Article 1.01, Paragraph A of this Section) to Architect with transmittal letter containing date, project title and number, contractor's name and address, title and number of each record document. Include certification letter that each document is complete and accurate. Contractor or his authorized representative shall sign submittal.
 - K. Completion Certificate: Submit signed Certificate as described in Section 01 72 00 Field Engineering.
- 1.08 FINAL COMPLETION AND FINAL PAYMENT
- A. Submit final Application for Payment to the Architect in accordance with the requirements of the General and Supplementary Conditions. Application shall not be submitted until all contract closeout requirements have been met.
 - B. Application shall reflect all adjustments:
 - 1. Original Contract sum
 - 2. Additions and deductions resulting from:
 - a. Change orders
 - b. Unit prices
 - c. Allowances
 - d. Deductions for uncorrected work
 - e. Deductions for reinspection fees (see below)
 - f. Other adjustments
 - 3. Total Contract Sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due
 - C. Reinspection Fees: Contractor shall reimburse the Owner for any reinspection fees charged by the Architect as a result of the Contractor's failure to achieve Substantial Completion or Final Completion when such status has been so stated by the Contractor pursuant to Article 1.04.
- 1.09 WARRANTIES MANUAL
- A. Upon completion of the work, the Contractor shall deliver to the Architect a written warranty addressed to the Owner, properly signed and notarized, warranting that the Contractor shall remedy any defects due to faulty materials or workmanship and pay for consequential damage resulting therefrom, which appear in his work within a period of one (1) year from the Date of Substantial Completion and in accordance with the terms of any special warranties (in excess of one year) as specified in individual Sections of the Specification. The Owner shall give notice of observed defects to the Contractor with reasonable promptness during the warranty period.
 - B. Submit special warranties as specified in individual Sections of the Specifications. All warranties shall include the name and address of the Contractor, subcontractor or supplier, the project

name, and the item(s) being warranted. Warranties specified under individual Sections of the Specification for periods longer than specified above shall be submitted as stated above and shall include payment for consequential damage due to faulty materials or workmanship for full duration of warranty.

- C. Submit to the Architect for his approval one (1) copy, indexed, in hard-cover three-ring binder. After initial copy is reviewed and approved, Contractor will then provide two (2) additional copies of the approved version, for a total of three (3) hard copies, plus one additional electronic copy (in .pdf format). Submit hard copies in separate, hard-cover, three-ring binders.
1. Index with tab dividers for each individual Specification Section, where warranty information is required by that Section.
 2. 8-1/2" x 11" in size.
 3. The Electronic version of the manual shall contain hyperlinked bookmarks that correspond to the tab dividers of the hard copy version as described above.

1.10 OPERATING AND MAINTENANCE MANUALS

- A. General: Submit to the Architect for his approval one (1) copy, indexed, in hard-cover three-ring binder each for Architectural, Mechanical, Electrical, Technology and Kitchen "Operations and Maintenance Manuals", with complete literature, complete operating instructions and technical data on all products or equipment requiring same. After initial copy is reviewed and approved, Contractor will then provide two (2) additional copies of the approved version, for a total of three (3) hard copies, plus one additional electronic copy (in .pdf format).
1. Information shall be typed and bound in hard-cover three-ring binders.
 - a. Index with tab dividers. One tab for each individual Specification Section. **Manuals tabbed by Subcontractor name in lieu of Specification Section number are not acceptable and will be rejected.**
 - b. 8-1/2" x 11" in size.
 2. The Electronic version of the manual shall contain hyperlinked bookmarks that correspond to the tab dividers of the hard copy version as described above.
- B. Architectural - By General Contractor: Where required by individual sections of the Specifications, provide complete literature, operating instructions and technical data on all products or equipment requiring same. Provide as a minimum the following:
1. Suppliers, with contact information.
 2. Maker, model number, style, color etc.
 3. Repair and warranty information.
- C. Mechanical - By Mechanical Contractor: Manual to have tab dividers to each major equipment section to facilitate loading information on specified pieces of equipment. Identify all data within each section with identification numbers as they appear on drawings. Include as a minimum the following data:
1. Alphabetical list of all system components, with the name, address and 24-hour telephone number of the company responsible for servicing each item during the first year of operation.
 2. Operating instructions for complete system including:
 - a. Emergency procedures for fire, or failure of major equipment
 - b. Major start, operation and shut-down procedure
 3. Maintenance instructions including:
 - a. Valve tag and other identified equipment lists
 - b. Proper lubricants and lubricating instructions for each piece of equipment
 - c. Necessary cleaning, replacement and / or adjustment schedule
 4. Manufacturer's data on each piece of equipment including:
 - a. Installation instructions
 - b. Drawings and specifications

- c. Parts lists
 - d. Complete wiring and temperature control diagrams (as-builts)
 - e. Marked or changed prints locating all concealed parts and all variation from the original system design
5. Schematic flow diagram showing all component parts including valves of the system. Number of valves in accordance with the valve schedule as required under another section of these specifications.
 6. Other items as required by Divisions 22 and 23.
- D. Electrical - By Electrical Contractor: Manual to have tab dividers for each major equipment section to facilitate loading information on specified pieces of equipment. Identify all data within each section with identification numbers as they appear on drawings. Include as a minimum the following data:
1. Operating instructions for systems including.
 - a. Distribution System
 - b. Fire Alarm System
 - c. Emergency Generator
 - d. Clock System
 - e. Programmable Electronic Communication System
 - f. Dimming System
 2. Manufacturer's data on each piece of equipment including:
 - a. Installation instructions
 - b. Drawings and specifications
 - c. Parts lists
 3. Maintenance instructions.
 4. Devices and Device Plates
 5. Service Ground Test Reports
 6. Letters of Certification for Intercom and Fire Alarm Systems
 7. Luminaires and Lamps
 8. Other items as required by Division 26
- E. Technology - By Low Voltage Contractor: Where required by individual sections of the Specifications, provide complete literature, operating instructions and technical data on all products or equipment requiring same. Provide as a minimum the following:
1. Suppliers, with contact information.
 2. Maker, model number, style, color etc.
 3. Repair and warranty information.
- 1.11 DEMONSTRATIONS
- A. Qualifications: Contractor and equipment representatives shall have a thorough knowledge of the particular installation and equipment.
 - B. Mechanical Systems Start-up: Refer to Divisions 22 and 23 for requirements.
 - C. Mechanical Systems- By Mechanical Contractor:
Instruct the Owner's representative(s) once on the proper operation and maintenance of the mechanical systems. As a minimum, presenting participants shall include Mechanical Contractor, Controls Subcontractor, and major equipment manufacturer's representative. The Design Engineer or Architect may attend this demonstration. Refer to Division 15 for additional requirements.
 1. These demonstration sessions shall be video recorded by the Contractor. At the completion of the instruction periods, a DVD of the video shall be turned over to the owner for future reference.

- D. **Electrical Systems - By Electrical Contractor:**
Instruct the Owner's representative(s) twice on the proper operation of the entire electrical installation, including any and all special systems provided under this contract. One of the instruction periods shall be for building users. Refer to Division 16 for additional requirements.
1. Include the following minimum number of sessions and hours of instruction to be conducted by the manufacturer's representatives:
 - a. Fire Alarm System 2 at 2 hours each
 - b. Emergency Generator 2 at 1 hour
 - c. Clock System 2 at 1 hour
 - d. Sound Systems/ Intercom 2 at 4 hours each
 - e. Commons Dimming System 2 at 1 hour
 - f. Lighting Controls 2 at 2 hours each
 2. These demonstration sessions shall be video recorded by the Contractor. At the completion of the instruction periods, a DVD of the video shall be turned over to the owner for future reference.
- E. **Technology Systems - By Technology Contractor:**
Instruct the Owner's representative(s) twice on the proper operation of the entire technology installation, including any and all special systems provided under this contract. One of the instruction periods shall be for building users. Refer to Division 17 for additional requirements.
1. Include the following minimum number of sessions and hours of instruction to be conducted by the manufacturer's representatives:
 - a. Data 2 at 1 hour
 2. These demonstration sessions shall be video recorded by the Contractor. At the completion of the instruction periods, a DVD of the video shall be turned over to the owner for future reference.

1.12 **MECHANICAL SERVICE AND MAINTENANCE**

- A. Contractor shall include four (4) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout one (1) year warranty period. During each service and maintenance call, check the following:
1. Safety devices on each piece of equipment
 2. Lubrication of moving parts and lubricate where required
 3. Adjust V belt drives
- B. In addition to service calls, the Contractor shall meet with the Owner's representative and Mechanical Engineer at the Building at eleven (11) months following Date of Substantial Completion to review warranty items and performance of HVAC systems.

1.13 **POST-CONSTRUCTION INSPECTION**

Prior to expiration of one (1) year from Date of Substantial Completion, the Owner, Architect and Contractor will inspect project to determine whether corrective work is required. Contractor will be notified in writing of all deficiencies. Contractor must correct noted deficiencies within ten (10) days of receipt of notification.

PART 2 - PRODUCTS

PART 3 - EXECUTION

Not Used.

END OF SECTION

DIVISION 2 EXISTING CONDITIONS
SECTION 02 41 00 SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.
4. Disposal of items not noted to be saved or reinstalled.
5. Securing exposed utilities.
6. Shoring and bracing.
7. Clean up.

B. Related Work:

1. Construction Facilities and Temporary Controls: Section 01 50 00.
- 2.

C. Referenced Standards/Minimum Criteria:

1. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this project.
2. Refrigerant Recovery Technician Qualifications: Certified by an EPA approved certification program.
3. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
4. Standards: Comply with ANSI A10.6 and NFPA 241.
5. Pre-demolition Conference: Conduct conference at Project site. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - a. Inspect and discuss condition of construction to be selectively demolished.
 - b. Review structural load limitations of existing structure.
 - c. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - e. Review areas where existing construction is to remain and requires protection.

D. Submittals Required:

1. Schedule of Selective Demolition Activities: Indicate the following:
 - a. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - b. Interruption of utility services. Indicate how long utility services will be interrupted.
 - c. Coordination for shutoff, capping, and continuation of utility services.
 - d. Locations of proposed dust-and-noise control temporary partitions and means of egress.
 - e. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed work.
 - f. Means of protection for items to remain and items on path of waste removal from building.
2. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

3. Pre-demolition Photographs/Video: Show existing conditions of adjoining construction and site improvements including finish surfaces that might be misconstrued as damaged caused by selective demolition operations.

E. Restrictions/Critical Criteria:

4. Owner may occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
5. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
6. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
7. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished. Contractor shall arrange and pay for disconnections, removal and capping of utility services within areas of demolition.
 - a. Arrange to shut off indicated utilities with utility companies.
 - b. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - c. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - d. Identify service lines and capping locations on project record documents.

1.02 PROJECT CONDITIONS

Asbestos Containing Materials: No asbestos containing materials are known to exist in the areas to be demolished. If the Contractor discovers materials which he suspects to contain asbestos, he shall cease work in the area and notify the Architect, who will issue further instructions.

PART 2 - PRODUCTS

2.01 ITEMS TO BE REMOVED AND REINSTALLED

- A. Materials, specialty items, equipment, casework, systems, doors, frames, hardware and other components scheduled or noted to be reused on other portions of the work, shall be carefully removed and stored at the site for later reinstallation. Damage caused during removal, storage, or reinstallation shall be repaired to the satisfaction of the Architect, at no cost to the Owner.
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

2.02 ITEMS TO BE REMOVED AND SALVAGED FOR THE OWNER

- A. The following items shall be removed and salvaged for the Owner's use:
1. Any Marker boards and tack boards not indicated to be reinstalled.
 2. Items as indicated on the demolition plan.
- B. After salvage and removal the following procedures shall be utilized:
1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents or containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designed by Owner or as indicated on Drawings.
 5. Protect items from damage during transport and storage.
- C. The Owner reserves the right to reject items which are designated to be salvaged and turned over to the Owner. In that event, Contractor shall dispose of items rejected by Owner.
- 2.03 ITEMS TO BE REMOVED BY OWNER
Items that are removed prior to the start of demolition will remain the property of the Owner.
- 2.04 DISPOSITION OF REMOVED ITEMS
Items indicated to be removed and not indicated to be salvaged or reinstalled shall become the property of the Contractor.
- 2.05 EXISTING ITEMS TO REMAIN:
Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protection: Erect weatherproof enclosures over new exterior openings in existing building to protect building interior until new finish materials are installed.
- B. Shoring and Bracing: Provide necessary temporary shoring and bracing to support and protect portions of existing building during demolition operations. Such shoring shall be left in place until permanent supports have been installed. The Contractor shall be solely responsible for the design, safety, and adequacy of temporary shoring and bracing and its ability to carry the load for which intended.
- C. Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not remove supports until safety is restored.

3.02 BUILDING DEMOLITION

- A. Demolish in an orderly and careful manner as required to accommodate new work. Protect existing foundations and supporting structural members. Cut concrete floors to a straight line with a saw before removing.
- B. Repair demolition performed in excess of that required at no cost to the Owner.

3.03 SITE DEMOLITION

Remove existing site improvements as indicated. Cut existing paving to a straight line with a saw where removal is required. Remove existing aggregate base course under paving indicated to be removed. Material may be reused for overlot fill but may not be used for foundation backfill or base course under new paving.

3.04 DISPOSITION OF REMOVED ITEMS

Items and materials indicated to be removed and not indicated to be salvaged or reused shall become the property of the Contractor. Items and materials indicated as such shall be

removed by the Contractor to an approved licensed landfill, to a facility designated for acceptance of the specific material, or to the Contractor's own storage facility.

3.05 CLEANING

The Contractor shall at all times during the demolition keep the premises free from accumulations of waste material or rubbish caused by his employees or work. At the completion of the work, Contractor shall remove rubbish, tools, and surplus materials. Leave the premises clean and ready for subsequent work.

END OF SECTION

Not for Construction

DIVISION 3 CONCRETE
SECTION 03 10 00 CONCRETE FORMS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete Formwork Materials
2. Formwork Accessories
3. Miscellaneous Materials

B. Work Installed But Not Furnished Under This Section:

1. Cast-in items such as angles, plates, pipe rail sleeves, anchor bolts, etc.: Furnished under Section 05 50 00.
- 2.

C. Related Sections:

1. Site Concrete: Section 32 16 00
2. Concrete Reinforcement: Section 03 21 00
3. Cast-in-Place Concrete: Section 03 30 00
4. Joint Sealers: Section 07 92 00
5. Mechanical / Electrical: Division 23 and Division 26

1.02 REFERENCE STANDARDS

Design and construction shall follow recommendations of ACI 301.

1.03 SUBMITTALS

A. Product Data: Submit to the Architect copies of manufacturer's product data for each component and material required plainly identified in accordance with Sections 01 33 00 and 01 33 23.

B. Samples: Submit to the Architect for approval a one quart sample and gradation data for Gravel layer and Blotter layer material.

1.04 QUALITY ASSURANCE

Contractor shall assume all responsibility for the strength and safety of the formwork. Provide necessary design, construction, materials and maintenance to produce the required concrete work safely.

1.05 ENVIRONMENTAL REQUIREMENTS

Contractor shall take special precautions to protect and keep finished interior concrete slab and blotter layer beneath slab dry until installation of finished floor.

PART 2 - PRODUCTS

2.01 FORMWORK MATERIALS

A. Exposed Concrete:

1. New B-B Plyform
2. Class 1
3. EXT-APA sanded
4. 4' x 8' sheets.

B. Non-exposed Concrete: Plywood, steel, or dressed lumber.

2.02 FORMWORK ACCESSORIES

- A. Form Ties: Adjustable in length to permit tightening of forms and of such type to leave no metal closer than 1" to the surface nor holes or depressions larger than 7/8" in diameter.
- B. Clamps, Brackets, Braces, Washers, Wedges, Walers, Etc.: Contractor's option.

2.03 MISCELLANEOUS MATERIALS

- A. Form Oil: Non-staining. Contractor's option.
- B. Interior Slab Edge Premolded Filler: 3/8" thick, bituminous fiber type in accordance with ASTM D1751.
- C. Exterior Wall Slab Edge Insulation: 3/4" thick foil faced polyisocyanurate rigid insulation.
- D. Under slab Vapor Retarder: Vapor Retarder Membrane, minimum Class A / ASTM E-1745-09, ASTM E96 permeance rate of 0.01 or less, any of the following:
 - 1. Reef Industries, Griffolyn 15 mil.
 - 2. Stego Industries, STEGO Wrap 15 mil.
 - 3. Raven Industries, VaporBlock 15mil.
 - 4. Viper, VaporCheck 15 mil.
 - 4. or approved substitute
- E. Slab Expansion and Construction Joint Forms: Dayton Richmond Keyed Kold or approved substitute.
- F. Premolded Expansion and Control Joint Fillers: Dayton Richmond Zipstrip or Demay Zipstrip.
- G. Under slab Gravel Bed: Minus 2" aggregate with less than 50% passing the No. 4 Sieve and less than 5% passing the No. 200 sieve. Crusher fines or gravel.

PART 3 - EXECUTION

3.01 PLACEMENT

- A. Walls, Footings: The use of earth as a form will not be allowed unless specifically detailed on drawings. Lap forming with dressed lumber or plywood will not be allowed. Forms shall conform to shape, lines and dimensions of the members shown on the drawings and shall be substantial and sufficiently tight to prevent leakage of concrete. Properly brace or tie to maintain position, shape, and lateral stability, and provide sufficient strength to carry construction operations and material dead loads without deflection or vibration. Forms shall be designed to be capable of needed adjustments and shall be carefully watched as work proceeds with all faults promptly corrected. Where finished concrete is to remain exposed, joints shall be regularly spaced and held to a minimum both horizontally and vertically. Provide access panels in formwork for cleanout or pouring as required. Install voids where indicated.
 - 1. The offset between adjacent pieces of formwork facing material at walls exposed to view shall not exceed Class A (1/8 inch) as defined by ACI 117.
- B. Rustication Joints, Molding or Bevels: Securely nail within the forms using finish nails. All exposed exterior corners of concrete, including top of foundation walls, shall be chamfered 3/4" unless otherwise indicated.
- C. Construction Joints: Use construction joints at temporary stopping of concrete placement or as shown on the drawings. Submit to the Architect for approval, the locations of desired

construction joints. Leave joints in reinforced structural members rough and provide longitudinal or vertical keys at least 1-1/2" deep.

- D. **Slabs on Grade:** Care shall be taken to obtain a smooth level surface so slabs will be of uniform thickness as required throughout. Slabs shall be divided by construction or control joints in areas no larger than 225 square feet in any one piece, nor longer than 15 feet in any direction unless indicated otherwise. Install premolded joint filler around entire perimeter joint between exterior wall and interior slab-on-grade. Hold top of joint filler down as required to obtain specified depth of sealant. Location of other interior construction joints and control joints shall be as noted in this Section or as shown on the drawings. Joint forms shall be placed in a straight line flush with finished surface and in accordance with the manufacturer's direction. Wire all bottom alignment slots and bottom of key to all metal support stakes. Reinforcement shall extend through joint form unless so noted on the drawings. Sawed joints may be substituted for joint forms at control joints. Sawed joints shall be one-fourth of the slab thickness in depth. Joint sawing shall be timed properly with the setting of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw, and shall be completed before shrinkage stresses have developed sufficiently to induce cracking.
- F. **Anchors, Inserts, Blockouts, and Built-In Items:** Anchor bolts, inserts, form blockouts and other items built into the concrete shall be securely fastened to formwork or held in place with templates. Insertion into concrete after placement will not be allowed.

3.02 FORM COATING

Coat the surface of formwork prior to concrete placement. Apply coating in strict accordance with manufacturer's directions. Apply coating prior to the placing of the reinforcement. Promptly remove any excess coating material.

3.03 FORM REMOVAL

- A. Remove forms in such a manner as to ensure the complete safety of the structure. Forms in general may be removed from vertical surfaces after 24 hours from time of placing and from horizontal surfaces 72 hours from time of concrete placement unless otherwise specified under Cold Weather Placement in Section 03 30 00.
- B. Keep shoring and forming of elevated structural slabs in place until tests indicate concrete has achieved minimum strength of 3,000 psi.

3.04 REUSE

Clean reusable form material prior to construction of forms. No form material will be acceptable for reuse if, in the opinion of the Architect, it will not produce a finished surface required by these Specifications.

END OF SECTION

SECTION 03 20 00 CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Concrete Reinforcement
- B. Work Furnished But Not Installed Under This Section:
 - 1. Vertical Reinforcing Steel for Reinforced Masonry: Installed under Section 04 20 00

1.02 SUBMITTALS

Submit shop drawings in accordance with Sections 01 33 00 and 01 33 23. Show size, configuration, pertinent dimensions, number, exact position, and spacing of reinforcement and the exact location of all openings, framing, or special conditions affecting the work.

1.03 QUALITY ASSURANCE

Reference Standards:

- 1. Detailing, fabrication, and placement: Follow ACI 301, 315 and 318, latest editions, unless otherwise noted herein or on the drawings.
- 2. Bar Bending Details and Placing Drawings: In accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI 315, latest edition).

1.04 DELIVERY, STORAGE AND HANDLING

Unload and store reinforcing bars so they will be kept free of mud. Store on timber skids while awaiting use.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars: Conform to Structural General Notes on the drawings.
- B. Bar Supports and Spacers: Contractor's option. Refer to Structural General Notes on the drawings.
- C. Tie Wire: No. 14 or No. 16 gauge, black, soft iron wire.
- D. Welded Wire Fabric: Conform to ASTM A185. Welded wire fabric shall be supplied in flat sheets. Refer to individual specification Sections and drawings for size and gauge of fabric.

PART 3 - EXECUTION

3.01 EXAMINATION

Provide 48 hours minimum notice to the Architect to allow observation of concrete reinforcement before placing concrete.

3.02 PLACEMENT

- A. Bending: Bend reinforcement cold. Bars shall be full length as required and accurately bent according to details. Bars shall be bent only once. No bar partially embedded in concrete shall be field bent except as shown on the drawings or specifically permitted by the Architect.
- B. Placing: Place reinforcement accurately and hold firmly in place before and during the placement of concrete. Provide minimum concrete protective cover for reinforcement from the

exterior face of members in accordance with ACI 318. Provide bar supports and spacers to place bars in the proper location and wire adequately at intersections to hold bars firmly in position while concrete is placed. Dowels shall project 36 diameters unless otherwise shown. Wire bent dowels in place before concrete placement.

- C. Splicing: Wherever it is necessary to splice reinforcement other than as shown on the drawing, the character of the splice shall be approved by the Architect on the basis of the stress in the reinforcement at the splice. Splicing shall not be made at points of maximum stress nor shall adjacent bars be spliced at the same point. Lap continuous bars as noted on the drawings.
- D. Supports and Spacers: Types of supports and spacers are optional with the installer. Supports shall be properly spaced and shall have sufficient strength to carry the loads of reinforcing steel and concrete without collapsing or allowing bars to sag. Concrete bricks may be used to support mats of bars with the approval of the Architect. Bar supports and spacers, which will be in contact with concrete surfaces exposed to weather, shall be galvanized or plastic coated. Do not use bar supports to support runways for concrete buggies or similar loads.
- E. Tolerances: Conform to placing tolerance specifications of ACI 301.

3.03 WELDED WIRE FABRIC

Lay welded wire fabric continuously, with edges and ends overlapping adjoining sheets a minimum of one full mesh plus 2", tied and placed over all piping and conduit. Properly support the fabric by chairs or other approved methods to the center of all the slabs during the depositing of concrete. Where required, construct bulkheads at construction joints and screeds to place the fabric in the proper position.

3.04 CLEANING

Clean reinforcement prior to placing concrete to remove scale, oil, ice, or other coatings that will destroy or reduce the bond, including concrete from previous concrete placements.

3.05 FIELD QUALITY CONTROL

Special Inspection of reinforcement shall be performed in accordance with the Statement of Special Inspections as submitted to the Building Official. This inspection shall be performed by an approved special inspector selected and paid for by the Owner.

END OF SECTION

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Cast-in-Place Concrete

- B. Related Sections:
 - 1. Section 01 33 00: Submittals
 - 2. Section 01 71 23: Field Engineering
 - 3. Section 03 10 00: Concrete Forms and Accessories
 - 4. Section 03 20 00: Concrete Reinforcement
 - 5. Section 32 16 00: Site Concrete

1.02 REFERENCES

- A. Reference Standards: Follow American Concrete Institute (ACI) Standards 301, 305R, 306R, 308R and 309, latest edition, except as modified by these specifications.

1.03 SUBMITTALS

- A. Quality Control Submittals:
 - 1. Mix Designs: Prior to placing concrete, the Contractor shall submit concrete mixes to the Architect for approval. Separate mix designs shall be submitted for each application of concrete to be used in the project. Submittals shall include all information used in designing the mixes. See Article 2.02 for design procedures.
 - 2. Test Reports: Reports of control tests, special tests or core tests specified under Article 3.09 shall be distributed by the testing laboratory as listed under Section 01 45 00.

- C. Samples:
 - 1. Integral Color Pigment: Submit complete line of manufacturer's standard colors for selection by Architect.

1.04 QUALITY ASSURANCE

- A. Design Criteria: See Article 2.02.

- B. Testing Agency: Testing shall be done by an approved testing laboratory selected and paid by the Owner. See Article 3.11 and Section 01 45 00.

- C. Source Quality Control: The Architect shall be offered uninterrupted access to the ready-mix batching plant at all times that the work is in progress.

- D. Record of Work: A record shall be kept by the Contractor listing appropriate location and the time and date of placement of all concrete for the structure. Such record shall be kept until the completion of the project and shall be available to the Architect for examination at any time.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Hauling Time: Discharge concrete transmitted in a truck mixer, agitator or other transportation device within 1-1/2 hours after the mixing water has been added to the cement and aggregate.

- B. Additional Water: Deliver concrete to the job in exact quantities required by the design mix. Should additional water be required before placing the concrete, the Contractor shall have sole authority to authorize the addition of water. Any added water shall not exceed the maximum water / cement ratio or maximum slump of the approved mix design and, under no circumstance

shall more than one half gallon per yard be added. Any additional water added to the mix after leaving the batch plant shall be indicated on the truck ticket and signed by the Contractor. Where extra water is added to the concrete it shall be mixed thoroughly for 40 revolutions of the drum or 3-1/2 minutes at mixing speed, whichever is greater.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Cold Weather Placement:

- a. When for three successive days prior to concrete placement, average daily outdoor temperature drops below 40 degrees F. or when average outdoor temperature is expected to drop below 40 degrees F. on day of concrete placement, preparations, protection, and curing of concrete shall comply with Standard Specifications for Cold Weather Concreting (ACI 306R).
- b. Minimum temperature of concrete upon delivery shall conform to Specifications for Structural Concrete (ACI 301). Concrete temperature at placement shall conform to minimum values of ACI 306R, and shall not exceed minimum values by more than 20 degrees F.
- c. Subject to acceptance of Architect, a non-corrosive, non-chloride accelerating admixture may be used. Admixtures shall meet requirements of Articles 2.01 and 2.02.
- d. Do not place concrete on frozen subgrade. Frozen subgrade shall be thawed to minimum depth of two (2) feet prior to concrete placement.
- e. Minimum temperature of massive embedments at time of concrete placement shall be 32 degrees F.
- f. Comply with concrete protection temperature requirements of ACI 306R. Record concrete temperatures during specified protection period at intervals not to exceed 16 hours and no less than twice during any 24 hour period.
- g. Submittal of detailed procedures, means and methods for production, transportation, placement, protection, curing, and temperature monitoring of concrete during cold weather is not required.

2. Hot Weather Placement:

- a. When placing concrete in hot weather, follow recommendations of ACI 305R.
- b. Temperature of concrete at time of placement shall not exceed 85 degrees F.
- c. When air temperatures on day of placement are expected to exceed 90 degrees F., mix ingredients shall be cooled before mixing. Flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of mix water.
- d. Water Reducing and Retarding Admixtures may be used subject to acceptance of Architect. Admixtures shall meet requirements of Articles 2.01 and 2.02.
- e. Protect to prevent rapid drying. Start finishing and curing as soon as possible. Use of continuous fog sprays or evaporation retardant may be required by Architect for 24 hours after placement or work may be restricted to evening or nights, especially in times of low humidity.

3. General: Unless adequate protection is provided, concrete shall not be placed during rain, sleet, or snow. Rainwater shall not be allowed to increase the mixing water.

- B. Protection: Protect newly finished concrete from rain or hail damage. Cover adjacent masonry walls, glazing, and other finish materials with polyethylene sheeting or otherwise protect from damage due to placing of concrete slabs or sidewalks.

1.07 ENVIRONMENTAL REQUIREMENTS

Contractor shall take special precautions to protect and keep finished concrete slab dry in areas to receive resilient flooring, carpeting, wood floors, or poured seamless flooring. See Room Finish Schedule.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Materials:

1. General: Use ready-mixed concrete conforming with ASTM C94. No on-job mixed concrete will be allowed.
2. Cement: Conform to ASTM C150, Type I / II Cement.
3. Aggregates: Fine aggregate (natural sand) and coarse aggregate (gravel or crushed stone), shall conform to ASTM C33. Maximum coarse aggregate size shall be as indicated in mix design.
4. Air Entraining Agent: Conform to ASTM C260.
5. Chemical Admixtures: Conform to ASTM C494.
6. Mineral Admixtures: Conform to ASTM C618.

B. Miscellaneous Materials:

1. Curing Compound: Conform to ASTM C309, Type 1. Ensure compatibility of proposed curing compound with any finish or treatment to be applied to concrete surface.
2. Floor Sealer at Non-Stained or Non-Colored Concrete:
 - a. BASF Kure-N-Harden
 - b. US Spec Industraseal
 - c. or approved substitute
3. Polyethylene Sheeting: 6 mil minimum thickness, White color.
4. Integral Color Pigment: Davis Colors, concentrated mineral oxide pigment powder or approved substitute complying with ASTM C979. Color as selected by Architect from manufacturer's standard colors.
 - a. Sealer for Colored Concrete:
 1. US Spec Rocaseal
 2. Satin Finish sealer as approved by Integral Color Pigment Manufacturer for use on their product.
 - b. Integral Color Mockup: Include in Base bid, the cost to construct a maximum of two (2) sample panels for architect's approval. Panels shall be 18" x 18" x 2" thick, and composed of the same concrete mix as that scheduled. Construct panels using the same processes and techniques intended for use on the permanent work, including curing procedures.

2.02 MIXES

- #### A. Design:
- Conform to Structural General Notes on the drawings. Proportion ingredients for mixes in accordance with ACI 301, Section 4.2.3. Obtain this information in accordance with the latest ASTM Specifications. Should a special mix be required due to structural requirements, weather, or materials, the Contractor shall submit samples of cement and aggregate to be used to an approved testing laboratory. At the expense of the Owner, the testing laboratory will make an analysis of the materials and design the proper mix to be used.

B. Admixtures:

1. General: No admixtures will be allowed except as specified herein, unless authorized by the Architect. All requests for approval or substitution must be made by the Contractor and be accompanied by sufficient information and test data for evaluation. No calcium chloride, thiocyanates, or admixtures containing more than 0.05 percent chloride ions shall be added to concrete.
2. Acceptable Manufacturers: Admixtures shall be approved by the Architect and supplied by one of the following manufacturers:
 - a. BASF/Master Builders
 - b. Cormix Construction Chemicals
 - c. Sika
 - d. Euclid

- e. W. R. Grace
 - f. Degussa
 - g. US Spec
 - 3. Accelerating Admixtures: Do not use unless authorized by the Architect. Conform to ASTM C494, Type C or E. Dosage shall be per manufacturer's recommendations.
 - 4. Water Reducing and Retarding Admixtures: Do not use unless authorized by the Architect. Conform to ASTM C494, Type A or D. Dosage shall be per manufacturer's recommendations and as set forth in approved mix designs.
 - 5. Fly ash as a substitute for cement will be permitted in mix designs, unless otherwise noted. Fly ash shall conform to ASTM C618, Class C or F. Substitution of fly ash for cement shall not exceed twenty (20) percent of total cementitious materials by weight where permitted in mix design. Minimum replacement factor shall be 1 to 1.
 - 6. Fibrous Reinforcing: Virgin fibrillated polypropylene fibers containing no reprocessed olefin materials and having tensile strength of not less than 58,000 psi. Materials shall meet specifications of ASTM C-1116, Type III.
 - a. Fiber Length and Diameter: Per manufacturer's recommendation for placement application.
 - b. Acceptable Manufacturer and Products:
 - 1) Fibermesh Company – Fibermesh
 - 2) Euclid Chemical Co. - Fiberstrand
 - 3) Grace – Grace Fibers
 - 4) or approved substitute
 - 7. Integral Color Pigment Concrete: Color pigment concentrate shall be added to concrete mix at batch plant with ratio recommended by pigment manufacturer to match color selected by Architect, up to maximum of two (2) pounds of pigment per one (1) sack of cement.
- C. Chloride Ion Content: The maximum water soluble chloride ion concentration in the concrete mix shall not exceed 0.15 percent by weight of cement.
- D. Slump: Design mix to provide slumps indicated under mix type at placement. Concrete to be placed by pumping shall have a maximum slump as specified at the end of the hose.
- E. Mixing: Ready-mixed concrete shall conform to provisions of ASTM C94.
- 2.03 CONCRETE MIX TYPES
- General: Water reducing admixtures shall be used in mix designs as indicated and shall be optional for mixes not specifically noted. Mix designs shall be identified by the mix identification letter indicated below. Concrete shall have a minimum cementitious material content of 470 lbs. per cubic yard unless noted otherwise.
- A. Mix A - For Interior Slabs on Grade.
3500 psi (minimum)
Type I or Type I / II Cement
3/4" maximum aggregate size
3% maximum entrained air
4" maximum slump
Minimum of 540 lbs. of cementitious material per cubic yard
Use water reducing admixture per manufacturer's recommendations
Fly Ash may be substituted in specified amounts in this mix.
Maximum Water / Cement Ratio of 0.41 in this mix.
- B. Mix B - For Footings, Walls and Retaining Walls.
4500 psi
Type I / II Cement

3/4" maximum aggregate size
6% plus or minus 1-1/2% entrained air
4" maximum slump
Fly Ash may be substituted in specified amounts in this mix
Maximum Water / Cement Ratio of 0.41 in this mix

- C. Mix C - For Sidewalks, Curb and Gutter, Concrete Paving and Other Site Concrete.
3750 psi
Type I / II Cement
3/4" maximum aggregate size
6% plus or minus 1-1/2% entrained air
4" maximum slump
Minimum 540 lbs. of cementitious material per cubic yard
Use water reducing admixture per manufacturer's recommendations.
Use fibrous reinforcing at minimum dosage of 1.5 lbs. per cubic yard.
Maximum water / cement ratio of 0.45 for this mix.
Pigment added to this mix at locations indicated on drawings.
(Note: Modify Mix E as required to meet specification of local jurisdiction for concrete placed off-site, in local right-of-way.)

PART 3 - EXECUTION

3.01 EXAMINATION

Provide Architect with weekly concrete pour schedules and update as necessary.

3.02 PREPARATION

Do not begin concrete work until operations are complete enough to allow placement to be carried on as a continuous operation for the entire section that is to be placed. Clean equipment for mixing and transporting the concrete. Forms shall be cleaned of debris and ice and shall be wetted (except in freezing weather) and coated as specified under Section 03 10 00. If water accumulates in the forms it shall be pumped out before concrete is placed. The finish top surface of vertical members shall be clearly marked on the form walls.

3.03 CONCRETE PLACEMENT

- A. Placement: Place concrete in approximately uniform horizontal layers not over two (2) feet in height. Piling up of the concrete in the forms or chuting in such a manner to separate the aggregates will not be permitted.
- B. The recommendations of ACI 301, Section 5, shall be followed for placing concrete into forms. No concrete shall be dropped over four (4) feet. Accumulations of water on the surface of the concrete due to water gain, segregation, or other causes, during placement or consolidation, shall be prevented as far as possible by adjustments in the mixture. Provision shall be made for removal of such water as may accumulate.
- C. Consolidation: Consolidate concrete during and immediately after placement by means of mechanical vibrators. Supplement by hand spading at corners and angles of the forms, around embedded fixtures, and in other difficult areas. Mechanical vibrator to cycle at 10,000 cycles per minute or more. Use and type of vibrators shall conform to ACI 309, "Recommended Practice for Consolidation of Concrete".
- D. Finishing: Where tops of poured walls are to form a finished surface, concrete shall be immediately finished in the form by a skilled concrete finisher. Any such walls or surfaces not finished to level will be ordered removed and replaced. Exposed cast-in-place concrete columns shall have smooth surface texture – no spiral form lines are permitted.

- E. Integral Colored Concrete: Place at locations as indicated on the drawings in accordance with Section 32 16 00.

3.04 FLATWORK

- A. Screeds: The finish plane of horizontal surfaces shall be established by screeds, carefully aligned and securely set, spaced not over eight (8) feet apart and installed at the proper level or slope, prior to the placement of any concrete. Adjust screeds as required during concrete placement to account for joist and beam deflection.
- B. Tolerances:
 - 1. Concrete floors shall meet flatness surface tolerance of 1/4" in 10' except as otherwise noted.
 - 2. Where floor drains occur, slope concrete to drain as indicated on drawings.
- C. Finishes:
 - 1. The selection of finishes shall be in accordance with Section 5.3.4.2.c of ACI Standard 301. Finish surfaces sparingly with special tools, such as roller bugs, to force the coarse aggregate slightly below the surface. No jitterbug tampers are to be used. Dusting of wearing surfaces with dry materials will not be permitted.
 - 2. Unless otherwise noted, interior concrete slab finish, on grade shall be troweled.
- D. Corrective Measures: Upon completion of specified finish and cure, and before placement of finish flooring, Contractor shall verify that tolerances specified in 3.04 B above have in fact been met. If due to issues such as, (but not limited to) slab curling, improper placement, and improper finishing, etc. tolerances specified herein are not met, then the Contractor shall take whatever corrective measures that are necessary to achieve specified flatness, surface tolerance, and finish. Corrective measures shall include (but are not limited to) slab grinding, filling and replacement.

3.05 TREATMENT OF FORMED SURFACES

- A. Form Removal: Finish concrete surfaces covered by formwork immediately after forms have been removed. Do not expose more surface area than can be finished in one working day.
- B. Patching: Patch voids, form tie holes, honeycombs, or damaged areas in accordance with the ACI Standard 301, Section 5. Cut out large defective areas a minimum of one (1) inch deep, and patch as specified. Add white cement to patching grout as required to match color of existing concrete where patches are exposed to view. Patch tie holes.
- C. Laitance: Remove deposits of laitance occurring on the top of the concrete surfaces as soon as the concrete has hardened sufficiently to prevent injury to the concrete. Repair areas where laitance is removed as specified in Article 3.05 Paragraph B.
- D. Unexposed Concrete Surfaces: Treat surfaces of concrete wall, slabs, beams, and columns, which are to be covered by subsequent work, as specified in Article 3.05 Paragraph B. Below grade unexposed concrete surfaces to be coated with fluid applied waterproofing shall be filled to the extent required by the manufacturer of the waterproofing material.
- E. Exposed Concrete Surfaces: Concrete surfaces, both interior and exterior, to remain exposed shall be carefully protected from damage and soiling during the progress of the work. Patch where required as specified in Article 3.05 Paragraph B. Upon completion of the work, any damaged or soiled surface shall be re-cleaned as required. At the discretion of the Architect, exposed concrete surfaces may be ordered to be "sack rubbed" if formed surfaces are not satisfactory in appearance, at no additional cost to the Owner.

3.06 CURING AND PROTECTION

- A. General: Protect exposed surfaces of concrete from premature drying and frost. Protect freshly placed concrete from rain and rapid drying. Adhere to special conditions as specified under Article 1.06.

Do not remove forms until such time as specified in Section 03 10 00. Remove forms carefully to avoid damage to the concrete surface. Protect edges and corners of concrete to prevent cracking, chipping or other damage and premature drying.

- B. Curing Compound Application: (Vertical Surfaces and All Exterior Concrete): Clean surfaces of loose sand, mortar, debris and grout; spray lightly with water and coat with a clear or translucent curing compound as soon as possible after removing forms. Apply curing compound, the same working day that the forms are removed.
- C. Wet Cure (Interior Slabs-on-Grade): Cover slabs with polyethylene sheeting after spraying LIGHTLY with water. Slab shall not be flooded. Special attention shall be given to securing adequate curing of slab edges. Polyethylene sheeting shall be as wide as practical, edges lapped a minimum of six (6) inches, weighted to prevent blow off, sealed to prevent loss of moisture. Sheeting shall remain tightly in place a minimum of seven (7) days. Follow recommendations of ACI 308R.
- D. Protection: Protect concrete surfaces from staining, cracking, chipping and other damage during progress of work. Leave concrete in good condition upon completion.

3.07 FLOOR SLAB SEALING AT NON-STAINED OR NON-COLORED CONCRETE

- A. Apply sealer to concrete floors not receiving other finishes (see Room Finish Schedule). Not sooner than 30 days following completion of wet cure, apply sealer uniformly over clean floor, with an application method which will leave no bubbles, pin holes or gaps, at a rate not to exceed 250 square feet per gallon. Prior to completion of project, apply second coat of sealer in same manner over clean floor.

3.08 MISCELLANEOUS CONCRETE REQUIREMENTS

Other concrete work indicated on the drawings shall be provided, even though not specifically mentioned herein, as necessary, to complete the work. Miscellaneous concrete includes, but not limited to, the following:

- A. Anchors: Install anchors furnished under Sections 05120 and 05500 in accordance with approved shop drawings for structural or miscellaneous steel.
- B. Equipment Bases and Pads: Provide concrete bases or pads for flag pole, exterior light poles, pumps, boilers, tanks, fans, transformers, floor mounted electrical equipment, etc., including anchor bolts and inserts in accordance with details or setting diagrams furnished by the Contractor responsible for installing the equipment. Finish bases or pads with a troweled finish, tool edges with rounded edges, chamfer outside corners. Bases or pads for equipment shall be located and sized as determined by the Contractor furnishing the equipment. Bases and pads which are supported by structural slabs or concrete on metal forming shall not be placed until supporting concrete has been in place seven (7) days minimum.

3.09 FIELD QUALITY CONTROL

- A. General: Testing shall be done by an approved testing laboratory, selected and paid for by the Owner in accordance with Section 01 45 00. Contractor shall make additional slump tests as required to maintain specified slump for each mix design.

- B. Tests: (the following are guidelines for testing paid by the Owner and as recommended to be performed by the Contractor.)
1. Test Priority: Control tests shall be used to determine the concrete quality throughout the project; however, special tests have precedence over control tests, and core tests shall have precedence over all previous tests. Reports of tests shall be distributed as specified under Section 01 45 00.
 2. Slump Tests: In addition to the Owner's testing, the Contractor shall provide necessary equipment and make tests in conformity with ASTM C143 as frequently as required to ensure specified slump for each mix design. The tests shall be made by a person thoroughly familiar with the requirements specified. Should the slump not comply with the limits stated in Article 2.03, the batch shall be rejected. The Contractor shall keep an accurate record of the time, location in the work, and the results of slump tests, which shall be available for inspection by the Owner and the Architect.
 3. Control Tests: Control tests of concrete work shall be made on every fifty (50) cubic yards or fraction thereof of concrete placed. In any case, a minimum of once during each day's pour. Samples shall be taken only after any extra water has been added and thoroughly mixed. Each test shall consist of six standard six (6) inch test cylinders (4" x 8" test cylinders acceptable at Contractor's option) cast and cured in accordance with ASTM C31 and ASTM C172. Two (2) cylinders shall be broken at the end of seven (7) days after placing, two (2) cylinders shall be broken at the end of 28 days after placing, and the remaining two cylinders shall be stored until their disposition is determined by the Architect. In general, the two (2) remaining cylinders will be broken only when the previous test reports indicated unsatisfactory results. When the 7 or 28 day tests indicate unsatisfactory results, all concrete work may be stopped until proper corrective measures have been taken to insure quality concrete in future work and all corrections deemed necessary have been made. Tests shall be made at the time control tests are taken and so stated in the reports to determine the slump, air content, unit weight, and temperature of the concrete. All tests shall be made in accordance with ASTM C143, C173 or C231, C138, and C1064 respectively.
 4. Special Tests: Should the Contractor desire control tests to facilitate the early removal of forms, they shall be made in addition to those specified for control tests and shall be completely job cured. The expense for making additional test cylinders, testing, curing, and protection shall be the Contractor's.
 5. Core Tests: If, at any time, the concrete control test specimens show a compressive strength at 28 days of less than that required or if the concrete has been frozen before it has taken the final set; so severely that, in the opinion of the Architect, its strength has been adversely affected; the Contractor shall, at his own expense, have sufficient core tests taken at the number and location to be approved by the Architect, to determine the actual condition of the concrete. The securing, preparing, and testing shall be in accordance with ASTM C42. Should the tests reveal that the concrete does not meet the requirements of this Specification, the Contractor shall, at his own expense, replace the entire section involved and/or make all corrections deemed necessary by the Architect.
- C. Special Inspection: Special Inspection of Structural Concrete Construction shall be performed in accordance with the Statement of Special Inspections as submitted to the Building Official. This inspection shall be performed by an approved special inspector selected and paid for by the Owner.

END OF SECTION

SECTION 03 39 00 MOISTURE VAPOR AND ALKALINITY CONTROL SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Application of Moisture Vapor and Alkalinity Control System at all new interior concrete slab areas that do not contain colored or pigmented concrete.
- B. Related Sections:
 - 1. Poured in Place Concrete: Section 03 30 00

1.02 SUBMITTALS

- A. Submit the following in accordance with Sections 01 33 00 and 01 33 23:
 - 1. Product Data: Submit copies of manufacturer's current catalog literature for the following:
 - a. Moisture Vapor And Alkalinity Control System. Include test results documenting product meets performance requirements specified.
 - b. Manufacturer's Installation/Application Instructions before beginning concrete floor slab system installation:
 - a. Submit one copy for Architect's information.
 - b. Maintain one copy on site until completion of product application.
 - 3. Manufacturer's Field Reports:
 - a. Submit manufacturer's representative's written approval of selected finish flooring materials adhesives and Installation methods.
 - b. Submit manufacturer's representative's written report regarding substrate review and initial installation methods, stating manufacturer's approval of substrate and
- B. Closeout Submittals: Submit the following in accordance with Section 01 77 00:
 - 1. Warranty: Submit Manufacturer's warranty for Moisture Vapor and Alkalinity Control System.

1.03 QUALITY ASSURANCE

- A. Product must meet or exceed the performance standards set forth by the following for curing, sealing, dust proofing and vapor emission and alkalinity control.
 - 1. ASTM C-1315-95, Liquid compounds having special properties for curing and sealing concrete.
 - 2. ASTM C-309 3.1.1. Class A test for liquid curing compounds.
- A. Installer Qualifications:
 - 1. Moisture Vapor And Alkalinity Control System Installer: Manufacturer's employee shall be on site for all concrete slab pours to install or train in application, document and return on every application thereafter to verify that proper procedures are followed.
- B. Regulatory Requirements: Moisture Vapor and Alkalinity Control System products shall be certified to be VOC compliant with all applicable federal, state and local regulations.
- C. Pre-Installation Conference: Hold conference with General Contractor's superintendent, independent testing laboratory, concrete formwork installer, reinforcement installer, concrete supplier, concrete flatwork contractor, pumping equipment operator, finish flooring installer(s) and manufacturer(s) representative(s) in accordance with Section 01 31 19.
 - 1. Notify Architect and Structural Engineer of meeting at least 10 days in advance.
 - 2. Discuss all matters pertaining to vapor retarder installation, proper forming, reinforcement placement, concrete supply, concrete placement, concrete testing, concrete curing, vapor emission control and preparation of slabs to receive finish flooring.

3. Take minutes and distribute to attending parties, Architect and Structural Engineer.

1.04 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Section 01 60 00.
- B. Delivery: Deliver products in original unopened manufacturer's containers with labels intact.
- C. Storage: Comply with Manufacturer's printed instructions.
 1. Moisture Vapor and Alkalinity Control System: Store in an interior, cool, dry place. Maintain minimum temperature of 40 degrees F. and a maximum 100 degrees F.
 - a. Material temperature shall be at least 50 degrees F before use.
 - b. If material freezes notify manufacturer.

1.05 WARRANTY

- A. Moisture Vapor and Alkalinity Control System Warranty: Manufacturer shall warrant floor covering systems against failure due to moisture vapor migration or moisture-born contaminates:
 1. Provide manufacturers standard, non-prorated written warranty complying with the following criteria.
 2. Warranty coverage and exclusions:
 - a. Coverage shall protect against failure of flooring from substrate as a result of moisture vapor migration or alkalinity for a period of ten (15) years from date of installation.
 - b. Coverage shall not exclude future emission levels exceeding those at time of system installation.
 3. Warranty Remedy:
 - a. Provide all labor and material required to replace all flooring systems that fail due to moisture vapor emission for a period of ten (15) years from date of installation.
 - b. Repair or replacement of moisture vapor emission control system.
 4. Insurance coverage of Manufacturer: Manufacture Product Insurance underwritten by a United States based product liability insurance carrier, with minimum "A" rating from Best or equivalent rating system, in the amount of \$2,000,000 per occurrence.
 5. Insurance binder shall name Owner as loss-payee.

PART 2 - PRODUCTS

2.01 MOISTURE VAPOR AND ALKALINITY CONTROL SYSTEM

- A. Acceptable Manufacturer: Curranseal PMC3300 – www.curranseal.com (714) 641-1121 Or approved substitute.
- B. Performance Requirements: Treatment shall be certified by independent testing agency to meet the following:
 1. ASTM C1315 and ASTM C309. Penetrating product to have no less than 34% solids content, leaving no sheen, volatile compound (VOC) content rating as required to suit regulatory requirements.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all work is complete to the point where installation may properly commence.
2. Verify that work of this section may be installed in strict accordance with the original design, all pertinent codes and regulations and all pertinent referenced standards.
3. In the event of discrepancy, immediately notify the architect. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
- B. Slab Preparation:
 1. Immediately after pouring, placing, saw cutting and final finishing; and the surface of the concrete has hardened sufficiently to sustain foot traffic, Moisture Vapor And Alkalinity Control System may be applied. Harsh weather or adverse job site conditions may delay the application. Timing of the application will be determined by the manufacturer's technical support.
 2. Protect any aluminum or glass surfaces against overspray during application.
 3. If overspray occurs, immediately flush surfaces with copious amounts of fresh water.

3.04 INSTALLATION

- A. Manufacture Field Technician will be onsite every application to provide technical services and document all areas treated for correct application and warranty coverage.
- B. Application of product by manufacturer signifies acceptance of substrate.
- C. All floor slabs-on-grade, elevated floor slabs and topping slabs shall receive specified Moisture Vapor and Alkalinity Control System treatment by single source manufacturer/installer.
- D. Begin the installation of the Moisture Vapor And Alkalinity Control System the day of the concrete pour or as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring such as sheet vinyl, V.C.T., carpet, vinyl back carpet, adhesives, wood, rubber, ceramic tile, and overlays.
 1. Compute and define concrete slabs into 1,000 sq.ft sections. Station each 5-gallon bucket of product at each 1,000 sq.ft. interval.
 2. Apply Moisture Vapor And Alkalinity Control System to the concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain foot traffic without damage. Harsh weather such as rain, snow, cold, wind, or jobsite conditions such as concrete not exposed to direct sunlight would affect the rate of concrete hydration and delay application until a more suitable application time permits as directed by Curranseal Technician.
 3. Spray apply the Moisture Vapor And Alkalinity Control System at the rate of 200 square feet per gallon. Broom product evenly over the substrate until product has completely penetrated the surface. If within 2 hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply product to these areas as soon as weather condition permits.

3.05 ENVIRONMENTAL REQUIREMENTS/CONDITIONS:

- A. Do not install system when temperature is below 40 degrees F. or above 100 degrees F.
- B. Restrict traffic from area where system is installed for a period of 2 hours after installation.

END OF SECTION

SECTION 03 48 16 PRECAST ARCHITECTURAL CONCRETE SPECIALTIES

PART 1 - GENERAL

- 1.01 SUMMARY
Section Includes: Precast Concrete Splash Blocks
- 1.02 SUBMITTALS
Submit product data and shop drawing of proposed units in accordance with Sections 01 33 00 and 01 33 23.
- 1.03 QUALITY ASSURANCE
- A. Manufacturer and transportation shall be by a company specializing in providing architectural precast concrete products and services.
 - B. Production of architectural precast concrete units shall comply with the provisions of Prestressed Concrete Institute (PCI) MNL 117, "Manual for Quality Control for Production of Architectural Precast Concrete Products".

PART 2 - PRODUCTS

- 2.01 MATERIALS:
All concrete and steel materials shall be as outlined in ACI 318 or AISC Manual of Steel Construction and conform to the latest ASTM standards.
- 2.02 PRECAST CONCRETE SPLASH BLOCKS
- A. Acceptable Manufacturers:
 - 1. Arco Concrete: SP-36124 Splash Block or equivalent of approved substitute. 12" wide x 48" long x 4" high.
 - 2. Approved Substitute
- 2.02 FABRICATION
Architectural precast concrete units shall be fabricated in accordance with the provisions of PCI MNL 117.
- 2.03 STORAGE
Product shall be stored utilizing good plant procedures and proper handling in such a way as to prevent damage or discoloration.

PART 3 - EXECUTION

- 3.01 DELIVERY, HANDLING, STORAGE AND PLACEMENT
Care shall be used in delivery and handling architectural precast concrete units and in their storage at the job site. Members shall be handled in such a manner so as to prevent physical damage. Place splash blocks at downspouts and other locations indicated on drawings.

END OF SECTION

SECTION 03 53 00 PATCHING CONCRETE TOPPING – UNIT PRICE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Patching existing concrete floors. Unit price shall be for each 10 s.f. area of floor determined to be patched.

B. Related Requirements:

1. Cast-in-Place Concrete: Section 03 33 00.

1.02 SUBMITTALS

A. Product Data: Submit for the following in accordance with Sections 01 33 00 and 01 33 23. Include application instructions.

1. Repair mortar.
2. Bonding agents.

1.03 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 01 60 00.

B. Repair Mortar Materials:

1. Deliver in original, unopened containers with manufacturer's name, labels, product identification, and batch numbers.
2. Store and condition in accordance with manufacturer's instructions.

1.04 PROJECT CONDITIONS

A. Environmental Requirements:

1. Comply with manufacturer's recommendations as to environmental conditions under which products may be applied.

PART 2 - PRODUCTS

2.01 REPAIR MORTARS

A. Trowel Grade Repair Mortar for horizontal Surface Patching: Two-component, polymer-modified, Portland-cement, fast-setting, trowel-grade mortar.

1. Acceptable Manufacturers and Products:
 - a. Sika Corporation - SikaTop 122 PLUS.
 - b. Tamms Industries – Duraltop Fast Set.

B. Bonding Adhesive for Bonding Repair Mortar to Hardened Concrete and Corrosion Protection of Embedded Steel: Two component. 100% solids, 100% reactive compound suitable for use on dry or damp surfaces and comply with ASTM C881.

1. Acceptable Manufacturers and Products:
 - a. Sika Armatec 110 EpoCem.
 - b. DURALPREP A.C.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Provide ample notice to Architect to allow for observation of substrate condition after removal of unsound concrete before application of repair material.

3.02 SURFACE PREPARATION FOR PATCHING

A. Shot blasting: Shot blast all surfaces to receive topping removing all scaling, loose or deteriorating concrete and surface contaminates, taking care not to damage adjacent surfaces.

- B. Acceptance: Beginning of installation means acceptance of substrate.
- C. Bonding Agent:
 - 1. Remove all laitance, dust, grease and other loose materials and contaminants. Wet concrete surfaces to thoroughly saturated surface dry condition. Surface shall be free of standing water.
 - 2. Apply bonding agent in accordance with manufacturer's recommendations. Spray apply bonding agent and supplement with stiff-bristle brush.
 - 3. Thoroughly coat indicated concrete surfaces.
 - 4. Minimum thickness of bonding agent on concrete substrate: 20 mils.

3.03 PLACEMENT OF REPAIR MORTAR

- A. General:
 - 1. Comply with manufacturer's recommendations.
 - 2. Place repair mortar no sooner than 12 hours and no later than 24 hours after application of bonding agent.
- B. Trowel Applied Surface Repairs:
 - 1. Scrub prepared mortar into substrate, filling pores and voids.
 - 2. Force material against edge of repair, working toward center.
 - 3. After filling cavity, screed off excess material.
 - 4. Finish with trowel.

3.04 CURING

- A. Beginning immediately after placement, protect exposed patched surfaces from premature drying.
- B. Curing method and duration shall comply with manufacturer's recommendations.
- C. Curing compound shall be applied if recommended by manufacturer.

3.05 CLEANING

- A. General: Apply materials in strict accordance with manufacturer's recommendations.
- B. Sandblasting: Vacuum all dust from sandblasting activities with an industrial vacuum cleaner intended for this purpose.

END OF SECTION

DIVISION 4 MASONRY
SECTION 04 05 13 PRE-BLENDED MASONRY MORTAR

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Pre-Blended Mortar for Unit Masonry.

- B. Related Sections:
 - 1. Quality Control: Section 01 45 00
 - 2. Masonry Grout: Section 04 05 16
 - 3. Masonry Accessories: Section 04 05 23
 - 4. Unit Masonry: Section 04 20 00

1.02 SUBMITTALS

- A. Mortar Mix Designs:
 - 1. Submit in accordance with product data provisions of Sections 01 33 00 and 01 33 23. Provide the following:
 - a. Mixing and preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods
 - d. Submit certified test reports showing that the cementitious components of the mortar mix comply with the specified requirements.
 - e. Submit certified test reports showing that the mortar mix complies with the specified requirements.

1.03 QUALITY ASSURANCE

Test Reports: Reports of quality control tests will be distributed by the testing laboratory in accordance with Section 01 45 00.

1.04 REFERENCE STANDARDS

- A. ASTM Standards as follows:
 - 1. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar
 - 2. ASTM C150 - Standard Specification for Portland Cement
 - 3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes
 - 4. ASTM C270 - Standard Specification for Mortar for Unit Masonry
 - 5. ASTM C595 - Standard Specification for Blended Hydraulic Cements
 - 6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Masonry
 - 7. ASTM C1157 - Standard Performance Specification for Hydraulic Cement
 - 8. ASTM C1329 - Standard Specification for Mortar Cement
 - 9. NCMA TR-88 – Hot & Cold Weather Masonry Construction Manual

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver mortar mixes to site in sealed bags. Identify each bag with material name and type.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: Conform to ASTM C150, Type I. Masonry cement not allowed.

- B. Hydrated Lime: Conform to ASTM C270, Type S.

- C. Aggregates for Mortar: Conform to ASTM C144.
- D. Water: Potable and free from deleterious amounts of acids, alkalies, or organic materials.
- E. Accelerators and Antifreeze Compounds: Not permitted.
- F. Other Admixtures, only with permission of Architect.

2.02 MIXES

- A. Mortar: Types S and N.
 - 1. Mix shall conform to ASTM C270 and contain Portland cement, hydrated lime, and aggregate in the proportions, by volume, specified in IBC Tables No. 2103.8(1) and by property specifications of IBC Table 2103.8(2).
 - 2. The use of accelerators or antifreezes will not be permitted.
 - 3. All exterior masonry mortar shall have color added in amount necessary to match selected color after curing.
 - 4. Hydrated lime in excess of the proportionate amount specified in ASTM C270 will not be allowed regardless of the compressive strength developed by the mix.

PART 3 - EXECUTION

3.01 PREPARATION

All equipment for mixing, transportation, and placing mortar shall be cleaned before starting work.

3.02 MORTAR MEASUREMENT AND MIXING

- A. Measurement: Add pre-measured amounts of concentrated mortar color as recommended by manufacturer to match selected color by Architect.
- B. Mixing: Mix factory blended dry materials for at least three (3) minutes and not more than five (5) minutes in a mechanical batch mixer, with the minimum amount of water to produce a workable consistency.
- C. Retempering: Mortars that have stiffened because of evaporation of water from the mortar shall be retempered by adding water as frequently as needed to restore required consistency. Mortar shall be used within two (2) hours after initial mixing.

3.03 FIELD QUALITY CONTROL

- A. Mortar
 - 1. Test in accordance with ASTM C780 with the following exception: Verify compressive strength by obtaining a minimum 20 pound uniform sample of dry blend, prepare mix as specified and test in accordance with applicable portions of ASTM C270.
 - 2. Testing Agency: Mortar tests will be conducted by a testing laboratory selected and paid by the Owner.
- B. Special Inspection: Special Inspection of masonry mortar shall be performed in accordance with the Statement of Special Inspections as submitted to the Building Official. This inspection shall be performed by an approved special inspector selected and paid for by the Owner.

END OF SECTION

SECTION 04 05 16 PRE-BLENDED MASONRY GROUT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Pre Blended Grout for Unit Masonry.
- B. Related Sections:
 - 1. Quality Control: Section 01 45 00
 - 2. Masonry Mortar: Section 04 05 13
 - 3. Masonry Accessories: Section 04 05 23
 - 4. Unit Masonry: Section 04 20 00

1.02 SUBMITTALS

- A. Grout Mix Designs:
 - 1. Submit in accordance with product data provisions of Sections 01 33 00 and 01 33 23. Provide the following:
 - a. Mixing and preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods
 - d. Submit certified test reports showing that the cementitious components of the grout mix comply with the specified requirements.
 - e. Submit certified test reports showing that the grout mix complies with the specified requirements.

1.03 QUALITY ASSURANCE

Test Reports: Reports of quality control tests will be distributed by the testing laboratory in accordance with Section 01 45 00.

1.04 REFERENCE STANDARDS

- A. ASTM Standards as follows:
 - 1. ASTM C143/C - Standard Test Method for Slump of Hydraulic Cement Concrete
 - 2. ASTM C150 - Standard Specification for Portland Cement
 - 3. ASTM C404 - Standard Specification for Aggregate for Grout
 - 4. ASTM C476 - Standard Specification for Grout for Unit Masonry
 - 5. ASTM C595 - Standard Specification for Blended Hydraulic Cement
 - 6. ASTM C1019 – Standard Method of Sampling and Testing Grout
 - 7. ASTM C1157 - Standard Performance for Hydraulic Cement
 - 8. NCMA TR-88 – Hot & Cold Weather Construction Manual

1.05 DELIVERY, STORAGE, AND HANDLING

Deliver mortar and grout mixes to site in sealed bags. Identify each bag with material name and type.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland Cement: Conform to ASTM C150, Type I. Masonry cement not allowed.
- B. Hydrated Lime: Conform to ASTM C270, Type S.
- D. Water: Potable and free from deleterious amounts of acids, alkalies, or organic materials.

- E. Aggregates for Grout: Conform to ASTM C404.
- F. Accelerators and Antifreeze Compounds: Not permitted.
- H. Other Admixtures, only with permission of Architect.

2.02 MIXES

- A. Grout for Masonry: Comply with ASTM C476. Proportion with sufficient water added to produce consistency for pouring without segregation.
 - 1. Minimum: 28-day compressive strength: 2,000 psi.
 - 2. Aggregate Size: 3/8 inch maximum.
 - 3. Design Slump: Seven (7) inch minimum, ten-(10) inch maximum.

PART 3 - EXECUTION

3.01 PREPARATION

All equipment for mixing, transportation, and placing grout shall be cleaned before starting work.

3.02 MEASUREMENT AND MIXING

- A. Mixing: Mix factory blended dry materials for at least five (5) minutes in a mechanical batch mixer, with the minimum amount of water to produce a workable consistency.
- B. Retempering: Do not retemper grout. Discard grout that cannot be easily pumped or poured.

3.03 FIELD QUALITY CONTROL

- A. Compressive strength shall be sampled and tested in accordance with ASTM C1019.
- B. Testing Agency: Grout tests will be conducted by a testing laboratory selected and paid by the Owner.
 - 1. Test Specimens: Take grout samples as grout is being placed into the wall. Construct three (3) test specimens in accordance with ASTM C1019 under the observation of the testing agency. Cure, protect, and store specimens on-site for 48 hours. Protect from freezing and variations in temperature until collected by testing agency.
 - 2. Frequency: Minimum of one (1) sample consisting of three (3) specimens shall be built and tested for each 5,000 square feet of wall area as masonry construction progresses.
- C. Special Inspection: Special Inspection of masonry grout shall be performed in accordance with the Statement of Special Inspections as submitted to the Building Official. This inspection shall be performed by an approved special inspector selected and paid for by the Owner.

END OF SECTION

SECTION 04 05 23 MASONRY ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Wall Ties and Reinforcing
 2. Control Joints
 3. Weep System Materials
 4. Mortar Dropping Collection System
 5. Masonry Flashing
 6. Structural Member Isolation Material
- B. Related Sections:
1. Concrete Reinforcement: Section 03 20 00
 2. Masonry Mortar: Section 04 05 13
 3. Masonry Grout: Section 04 05 16
 4. Unit Masonry: Section 04 20 00
 5. Building Insulation: Section 07 21 00
 6. Flashing and Sheet Metal: Section 07 62 00
 7. Joint Sealants: Section 07 92 00

1.02 SUBMITTALS

Submit manufacturer's product data for each component and material required plainly identified in accordance with Sections 01 33 00 and 01 33 23.

1.03 DELIVERY, STORAGE AND HANDLING

Store accessories off the ground and under cover.

PART 2 - PRODUCTS

2.01 WALL TIES AND REINFORCING

- A. Acceptable Manufacturers:
1. Dur-O-Wall.
 2. Hohmann & Barnard, Inc
 3. or approved substitute
- B. Finishes: Hot-dipped per ASTM A153 - Class B 2 (1.50 oz. / sq. ft.) at exterior and cavity walls. All others regular mill galvanized per ASTM A641.
- C. Horizontal Reinforcing: Dur-O-Wal, Hohmann & Bernard, or equivalent of other acceptable manufacturer. Use prefabricated corners and tees. Type as follows:
1. Single Wythe Walls:
 - a. Dur-O-Wall D/A 320 Ladur Type.
 - b. Hohmann & Barnard HB #220 Ladder Mesh Reinforcement
- D. Masonry Veneer Wall Ties: Dur-O-Wal, Hohmann & Bernard, Heckman Building Products, or equivalent of other acceptable manufacturer. Size for 2" minimum embedment of ties in mortar. Fasten with steel self-tapping screws. Type as follows:
1. At Stud Walls:
 - a. Heckman Building Products

1. POS-I-TIE: Veneer anchoring system with hot-dip galvanized triangle wire ties.
(AT CONTINUOUS INSULATION)
 - b. Hohmann & Barnard
 2. 2-Seal Tie: Veneer anchoring system with hot-dip galvanized triangle wire ties.
(AT CONTINUOUS INSULATION)
- E. Reinforcing Steel: Furnished under Section 03 20 00.
- 2.02 WEEP HOLE SYSTEM
- A. Single Wythe and Veneer Wall Weep System - "Cavity Weep" CV5010, as manufactured by Masonry Technology Inc., or equivalent of other approved manufacturer.
1. High-impact polystyrene strip, 0.024 thick. Formed with corrugations 3/16" deep.
 2. Weep legs: 2-1/4" wide at 9-1/2 inches on center.
 3. Continuous belt: 1 inch wide.
 4. Total Width: 6 inches.
 5. Color: Translucent
- B. Veneer Wall Steel Lintel Head Joint Weep System - "Head Joint Weep" HJW 3845, as manufactured by Masonry Technology Inc., or equivalent of other approved manufacturer.
1. Material: Aetac, 0.24 inch thick.
 2. Dimensions: 3/8 inch wide, 3/8 inch high, 4-1/2 inch long.
 3. Color: Light Gray
- C. Top of Wall Head Joint Weep System – "Cell Vent" as manufactured by Wire-Bond, Advanced Building Products, or equivalent of other approved manufacturer.
1. Material: ultra violet resistant polypropylene co-polymer.
 2. Dimensions: 3/8 inch wide, 2-1/2 inch deep, 3-3/8 inch long.
 3. Color: Gray
- 2.03 CONTROL JOINTS
3/8" thick non-asphaltic fiberboard.
- 2.04 MASONRY FLASHING
- A. Composite Thru-Wall Flashing, Hohmann & Barnard or approved manufacturer.
1. Hohmann & Barnard Textroflash composite thru-wall flashing with the following components:
 - a. H&B Primer-SA, water based, modified polymer primer.
 - b. H&B ENVIRO-BARRIER Mastic, single component water-based flexible mastic designed to seal terminations, edges of patches and overlaps in detail areas.
 - c. Hohmann & Barnard's T1 termination bar.
 - d. Preformed inside and outside corners and end dams.
- 2.05 MORTAR DIVERTER COLLECTION SYSTEM
- A. At Masonry Veneer Walls:
1. "Mortar Net" as manufactured by Mortar Net USA, Ltd.
 2. "Mortar Trap" as manufactured by Hohman & Barnard, Inc.
 3. Or equivalent of other approved manufacturer.

PART 3 - EXECUTION

3.01 WALL TIES AND REINFORCING

- A. Block Walls: Reinforce by use of horizontal steel reinforcement placed continuously in every second horizontal block course or 16" maximum on center vertically Use preformed corners and tees at corners and intersections (except at control or expansion joints), lapped minimum of 6".

- B. **Masonry Veneer Over Studs:** Bond masonry veneer to each vertical stud with veneer wall ties located not more than 16" on center vertically. Fasten to studs with two (2) stainless steel power-driven screws.

3.02 MASONRY FLASHING

- A. **Masonry flashing** shall occur over openings in exterior masonry walls, over exterior wall masonry bond beams, at the bottom or sill of exterior masonry walls, at shelf angles, and where otherwise indicated. Apply primer as recommended by manufacturer to all surfaces that will come into contact with flashing membrane. Lap and apply mastic over end joints in flashing. Where masonry meets another wall system or vertical reinforcement in grouted cell, provide and install preformed end dams. Apply mastic over end dams and lap flashing over area and seal to end masonry units.
 1. At Single-Wythe walls with light gauge furring on the inside face extend the masonry flashing up the continuous blocking attached to the furring, a minimum of 8 inches. Seal edge with flashing tape.
 2. **Sill Flashing at Masonry Veneer Walls:** Extend masonry flashing up the face of gypsum sheathing or other substrate surface at least 8 inches. Attach flashing to substrate surface with termination bar. Weather Resistive Barrier shall lap over the masonry flashing and be sealed per the manufacturers instructions.

3.03 WEEP HOLE SYSTEM

- A. **Masonry Veneer Walls:** Install weep system in accordance with manufacturer's instructions.
 1. Place weep on masonry flashing, with continuous belt centered in cavity, and legs extending out from face of wall approximately 1 inch to 1-1/2 inches.
 2. Place bed joint of mortar on weep and lay masonry units.
 3. Tool joints and lightly score weep legs at face of wall.
 4. Crack off weep legs at score by pushing downward while mortar is still plastic.
 5. Finish tool joint and brush.
- B. **Masonry Veneer Walls - Steel Lintel Head Joint Weep:** Install head joint weep system in accordance with manufacturer's instructions.
 1. Place steel lintel head joint weeps at each head joint of first course of masonry on steel lintels. There should be no bed joint of mortar on steel angle.
 2. Spread bed joint of mortar on top of first course of masonry.
 3. Tuck point mortar into head joint and tool joint.
 4. Place edge of steel lintel head joint weeps as close to the exterior face of steel lintel as possible.
- C. **Masonry Veneer Walls – Top of Wall Head Joint Weep:** Install head joint weep system in accordance with manufacturer's instructions.
 1. Locate cell vents at top of Masonry wall at location as indicated on the drawings at 32" on center.
 2. Embed weep vents in vertical mortar head joints. Tool joints to prevent obstruction of weep spouts.
- D. **Single-Wythe Masonry Walls:** Install weep system in accordance with manufacturer's instructions.
 1. Place weep on masonry flashing, with continuous belt centered in masonry core, and legs extending out from face of wall approximately 1 inch to 1-1/2 inches.
 2. Place bed joint of mortar on weep and lay masonry units.
 3. Tool joints and lightly score weep legs at face of wall.
 4. Crack off weep legs at score by pushing downward while mortar is still plastic.

5. Finish tool joint and brush.

3.04 MORTAR DIVERTER COLLECTION SYSTEM

A. Masonry Veneer Walls:

1. Install according to the manufacturers instructions.
2. After first two courses of masonry have been laid, place a continuous row of "Mortar Net" in the cavity on the flashing.
3. Material thickness shall be determined according to the wall cavity thickness, so that material touches both walls of the cavity.
4. Place Mortar Net in all locations that weep system and masonry flashing is utilized, as indicated in 3.02 and 3.03 above.

B. Single-Wythe Masonry Walls:

1. Center CMU mortar diverter horizontally in the CMU. Install at one block course above the weep hole system.

3.05 CONTROL JOINTS

A. Provide control joints in masonry walls where indicated on the drawings or not more than 20' on center in locations approved by the Architect. Joints shall be installed completely through and full height of masonry unless indicated otherwise.

B. Horizontal joint reinforcing shall not continue across control joints. Extend control joints through bond beams. Bond beam reinforcing shall continue through control joint. Keep the control joint face free of mortar by using a continuous wood strip (3/8" x 3/4" deep) temporarily set in the wall. Control joints shall receive caulking as specified under Section 07 92 00.

1. At Single-Wythe Walls, caulk control joint on both sides of wall, regardless of whether interior face is exposed to view.

3.06 STRUCTURE ISOLATION

Wrap structural member with semi-rigid fiberglass before covering with masonry. Wire, staple, tape or glue in place to prevent displacement during installation of masonry.

3.07 COMPRESSIVE MATERIAL BELOW SHELF ANGLES

Where shelf angles are used to support masonry veneer in multi-story construction, install compressible neoprene strip on top of brick course below shelf angle before angle is installed. Hold in place with adhesive backing. Recess front edge of neoprene to match toe of shelf angle and to form recess for caulking as specified under Section 07 92 00.

3.08 MORTAR DROPPING COLLECTION SYSTEM

Install according to the manufactures instructions. After first two courses of masonry have been laid, place a continuous row of "Mortar Net" in the cavity on the flashing. Material thickness shall be determined according to the wall cavity thickness, so that material touches both walls of the cavity. Place Mortar Net in all locations that weep holes and masonry flashing is utilized, as indicated in 3.02 above.

END OF SECTION

SECTION 04 20 00 UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Sample Masonry Panels
2. Lightweight Concrete Block Masonry
3. Brick Masonry

B. Products Installed But Not Furnished Under This Section:

1. Mortar and Grout
2. Reinforcing
3. Masonry Accessories and Insulation
4. Bolts
5. Anchors
6. Nailing Blocks
7. Inserts
8. Steel Angle Lintels
9. Other Built-in Members

C. Related Sections:

1. Quality Control: Section 01 45 00
2. Concrete Reinforcing: Section 03 20 00
3. Pre Blended Masonry Mortar: Section 04 05 13
4. Pre Blended Masonry Grout: Section 04 05 16
5. Masonry Accessories: Section 04 05 23
6. Metal Fabrications: Section 05 50 00
7. Graffiti Resistant Coatings: Section 09 96 23
8. Building Insulation: Section 07 21 00
9. Joint Sealants: Section 07 92 00
10. Allowances: Section 01 21 13

1.02 REFERENCES

Reference Standards: Comply with listed recommendations of the following:

1. ASTM
2. Brick Institute of America
3. National Concrete Masonry Association

1.03 SUBMITTALS

A. Samples: Immediately after start of construction of the project, submit full range of CMU color samples for selection. Cut and deliver samples of selected exterior wall masonry units to the Architect for preparation of color sample boards. Samples shall be 4" x 8" and shall be cut to 1/2" thickness. Provide and deliver a total of six (6) samples showing three (3) selections of each of two (2) types of integrally colored block. Manufacturer shall not make exterior masonry units until samples have been approved by Architect. Submit full size sample of glass block unit specified.

B. Quality Control Submittals:

1. Test Reports: Reports of masonry prism tests shall be distributed by the testing laboratory as listed under Section 01 45 00.
2. Certificates: Furnish manufacturer's certification and test results indicating that masonry units meet specified ASTM requirements.

3. Mason Contractor must submit certification in at least one of the following:
 - a. Be a member of Rocky Mountain Masonry Institute.
 - b. Be enrolled in the Mason Certification Program of the Rocky Mountain Masonry Institute.
 - c. Have successfully completed the Mason Certification Program of the Rocky Mountain Masonry Institute.

1.04 QUALITY ASSURANCE

- A. Mock Ups: Furnish materials specified in quantity sufficient to construct a minimum 4' x 4' sample exterior masonry wall panel including types of masonry units as directed by Architect.
 1. Sample panel shall reflect the complete range of color (including expected color variations within each color) and texture of the proposed construction.
 2. Make such modifications as necessary to achieve panels satisfactory to the Architect.
 3. The panel shall be erected at a location on the site to be designated by the Architect and shall be maintained by the Contractor until ordered removed.
- B. Include in base bid, the cost to construct one (1) masonry sample panel. Panels rejected because of poor workmanship will be rebuilt by the contractor until accepted by the Architect, with no additional cost to the Owner
- C. Finish and appearance of exposed wall construction shall be in conformance with ASTM C90.

1.05 DELIVERY, STORAGE AND HANDLING

Inspect masonry units upon delivery and handle carefully to avoid chipping and breakage. Store on pallets until ready for use. Cover and protect against wetting prior to use, allowing air circulation under stacked units. Do not store near masonry cutting operations.

1.06 JOB CONDITIONS

- A. Environmental Requirements:
 1. Comply with the requirements of the 2009 IBC, Section 2104, for cold and hot weather preparation, construction and protection.
 - a. Any frozen masonry work will be prima facie evidence that the above cold weather requirements have not been complied with. The Contractor shall be required to remove and replace all frozen materials.
 2. Where exposed to weather, the top of masonry walls shall be covered at the end of each day's work using a weather resistive membrane weighted down to ensure its remaining in place. Maintain such protection until final capping of the wall.
 3. Grout: Place grout in masonry at a minimum temperature of 70 degrees F. and a maximum temperature of 120 degrees F. Maintain grouted masonry above 32 degrees F. for 24 hours following placement of grout.
 4. Admixtures: No mortar admixtures (except as specified in Section 04 05 13) permitted without written approval of Architect.
- B. Protection of Completed Work From Physical Damage: Protect projecting masonry susceptible to damage after setting by suitable planking well supported. Jamb's and sill of openings used for passage shall be securely boxed.
- C. Replace masonry work showing damage or disfiguration during the progress of work in its entirety. No patching or hiding of defects will be permitted.

PART 2 - PRODUCTS

2.01 MASONRY UNITS

- A. Lightweight Concrete Block:
 - 1. Aggregate: Conform to ASTM C331.
 - 2. Hollow and Solid Load bearing Units: Conform to ASTM C90.
 - 3. Classification: Type 1.
 - 4. Nominal Size: 8" high x 16" long x width shown on the drawings.
 - 5. Minimum net compressive strength: 1,500 / 1900 psi at 28 days.
 - 6. Acceptable Manufacturers: Basalite, Boral Best Block Co., or approved substitute.

- B. Face Brick Colors 1 & 2: Fired masonry brick made from clay
 - 1. Modular size; 7-5/8" long x 3-5/8" wide x 2-1/4" high.
 - 2. Shall meet requirements of ASTM C216, Type FBS, Grade SW.
 - 3. Provide two-faced corner bricks
 - 4. Provide 100% solid units where cores of units would be exposed to view or weather.
 - 5. Staining of bricks will not be allowed.
 - 6. Color: Colors shall be as selected by Architect.
 - 8. Texture: As selected by Architect.
 - 9. Acceptable manufacturers: Lakewood Brick, Summit Brick, Interstate Brick, General Shale or approved substitute.

- C. Common Brick: Conform to ASTM C62, Grade MW.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Before beginning work, inspect foundations or other bearing surfaces for proper grades and elevations, freedom from dirt and other foreign material.

3.02 PREPARATION

Surface Preparation: Remove dirt, ice, loose rust and scale from walls, ties and reinforcing prior to installation.

3.03 INSTALLATION

A. General:

- 1. Unless indicated otherwise on the drawings, lay masonry units one-half running bond. Adjust masonry dimensions as required to eliminate small cuts and to maintain one-half bond.
- 2. Maintain one-half running bond at 90 degree corners.
- 3. Lay masonry plumb and true to lines to the tolerances indicated. Provide full mortar joints. Mortar beds shall be spread smooth or only slightly furrowed.
- 4. In laying masonry, avoid adjustment to units after being set in position. Where an adjustment must be made after the mortar has started to harden, remove mortar and replace with fresh mortar.
- 5. Where cutting of units is necessary, make cuts with a motor-driven masonry saw.
- 6. Joints shall be plumb or level. Tool joints in interior or exterior masonry work, with a round tool to a depth as directed to make a smooth and concave joint. At exterior walls, tool the joints when they are thumbprint hard to provide the greatest resistance to water-penetration and to help minimize hairline cracks between the mortar and the CMU.
- 7. Common brick may be substituted for face brick wherever concealed from view. Use finished ends wherever ends of brick or split face block are exposed to view.
- 8. Mingling of brick to achieve a well blended appearance shall be the responsibility of the brick manufacturer prior to shipment of the brick to the project. Remove brick from pallet per the manufacturer's instructions contained on each pallet.

9. Lay out masonry openings to provide 1/4" maximum caulk joint at hollow metal jambs.
 10. At exterior block, all mortar joints shall be full and all head joints shall be "double-buttered" to assure complete coverage of all contact surfaces and maximum bond.
 11. The first course of hollow masonry units at foundations / grade beams shall be laid with a full mortar bedding starter joint.
 12. Where vertical cores of masonry units are to be solidly grouted, use full mortar bedding. At all other unit masonry work with hollow units, use face-shell bedding.
- B. Masonry Veneer: Where masonry veneer occurs over stud and concrete / masonry walls, bond veneer to backing with masonry veneer ties located and installed as indicated in Section 04 05 23. Keep cavities behind masonry veneer free of mortar droppings.
- C. Steel Door Jambs: Jambs set in masonry shall have jambs grouted full of mortar as wall is built.
- D. Built-in Members:
1. Sleeves of proper size shall be provided to permit passage of pipes through walls. Build in wall sleeves, anchors, plates, lintels and other steel members. Built-in members shall be properly set in masonry courses as walls progress.
 2. Openings in masonry walls over 12" in width shall have steel angle lintels of types indicated and specified, installed within masonry courses. Steel angle lintels will be furnished under Section 05 50 00.
- E. Pipe Chases and Recesses:
1. Provide chases in masonry walls where indicated or directed by subcontractors under Divisions 22, 23 and 26 for pipes and conduits.
 2. Build recesses where required for accommodation of chases and cabinets, radiation and unit heaters. Recesses shall have steel angle lintels if over 12" in width.
- F. Reinforced Masonry:
1. In addition to horizontal reinforcing specified in Section 40 05 23, reinforce block cores or cavities with No.4 deformed steel reinforcing bars at 6'-0" o.c. and grout as indicated, unless otherwise noted.
 2. Reinforced hollow unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. Maintain a clear, unobstructed vertical opening area measuring not less than 2" x 3".
 3. Hold vertical reinforcement in position at top and bottom and at intervals not exceeding 192 bar diameters.
 4. Fill cells containing reinforcement solidly with grout. Pour grout in lifts of 4' maximum. Consolidate grout at time of pouring by mechanical vibration. Reconsolidate by mechanical vibration to minimize voids due to water loss.
 5. When the grouting is stopped for one hour or longer, stop pouring of grout 1-1/2" below the top of the uppermost unit.
- G. Allowable Tolerances:
1. Maximum variation from plumb:
 - a. In lines and surfaces of columns, walls, and arises:
 - 1) 1/4" in 10'
 - 2) 3/8" in any story or 20' maximum
 - 3) 1/2" in 40'
 - b. For external corners, expansion joints and other conspicuous lines:
 - 1) 1/4" in any story or 20' maximum
 - 2) 1/2" in 40'
 2. Maximum variation from level or grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:

- a. 1/4" in any bay or 20'
 - b. 1/2" in 40'
 - 3. Maximum variation of linear building line from an established position in plan and related portions of columns, walls and partitions:
 - a. 1/2" in any bay or 20' maximum
 - b. 3/4" in 40'
 - H. Cutting and Patching: Cutting and patching of masonry shall be done by mason at his own expense wherever necessary for other trades. Such work shall be done by experienced mechanics. No cutting and patching shall be done which will injure the strength or appearance of finished work. No cutting of finished masonry for the purpose of building-in members will be allowed.
 - I. Joints and Tooling:
 - 1. All joints shall be plumb or level.
 - M. Control Joints: Install control joints as indicated but not more than 20' on center in all masonry walls. Review control joint layout with Architect before proceeding.
- 3.04 FIELD QUALITY CONTROL
- A. General: Compressive strength of masonry shall be tested in accordance with ASTM C1314.
 - B. Testing Agency: Prism tests will be conducted by a testing laboratory selected and paid by the Owner.
 - C. Prisms: Construct prisms for testing during construction using same materials and methods specified for preconstruction prism tests under Article 1.04. Prisms shall contain no masonry grout.
 - D. One set of three (3) prisms shall be built by the mason and tested in accordance with tests referenced at start of masonry construction. A minimum of one set of three (3) prisms shall be built and tested for each 5000 square feet of wall area as masonry construction progresses. Prisms shall be tested at the age of 7 days.
 - E. If average compressive strength of a set of prisms fails to achieve strength at 7 days corresponding to specified f'm strength at 28 days as established by pre-construction prism tests, or if Contractor fails to provide required prism test sets, the Contractor shall, at his own expense, have prism samples taken from masonry work in place, the size, number and location to be approved by the Architect, to determine the in place strength of the masonry. Testing Agency shall test these prisms. Should the tests reveal that the masonry does not meet the requirements of this Specification, the Contractor shall, at his own expense, replace the entire section involved and/or make all corrections deemed necessary by the Architect.
- 3.05 POINTING AND CLEANING
- A. Cut out defective joints and holes in exposed masonry and repoint with mortar. Take care to match color of exposed joints in masonry, which will not be painted or otherwise covered.
 - 1. Masonry joints found to be unsound, hollow, debonded, with cracks wider than 1/64 inch, or with any other defect which causes the Water Repellent Coating manufacturer to be unable to warrant the water repellency of their system, (see Section 07192) shall be cut out to a depth of 3/4 inch and repointed with mortar.
 - B. Daily Cleaning of Masonry: Make every practical effort to keep masonry work as clean as possible during construction. Remove mortar droppings and stains before they harden by giving

daily attention to brushing down the wall with a soft brush. At a minimum, dry brush masonry surfaces after mortar has set at end of each day's work and after final pointing.

C. Final Cleaning of Masonry:

Clean mortar, dirt and construction film from masonry using stiff brush and water when mortar is at least seven (7) days and not more than fourteen (14) days old. Remove efflorescence or other stain in accordance with masonry unit manufacturer's recommendations.

3.06 FINAL CLEANING DEVIATIONS FOR MASONRY AND INTEGRALLY COLORED BLOCK

A. Deviations from final cleaning methods specified in Article 3.05 must be requested in writing and approved by the Architect prior to starting masonry work. Should the use of commercial brick cleaners be requested, the written request must be accompanied by the following information:

1. Description of cleaning solution proposed, including manufacturer's name, descriptive literature, and dilution ratio.
2. Description of cleaning procedure proposed including wetting of walls as required to prevent chemical penetration into masonry.
3. Written approval from the masonry unit manufacturer. Statement to include same information required for this Article.
4. Statement from mason assuming responsibility for any deleterious effects to masonry or mortar, such as staining, darkening or fading of masonry units or mortar color, caused as a result of use of proposed products or methods of application.

B. No high pressure cleaning of brick or decorative faced block will be permitted. Pressure to be 100 psi maximum.

C. Muriatic Acid will not be permitted.

3.07 AREA CLEAN-UP

Upon completion of pointing and cleaning, leave the work area and surrounding surfaces clean and free of mortar spots, droppings, and broken masonry.

END OF SECTION

SECTION 05 50 00 METAL FABRICATIONS

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Steel handrail brackets and handrails
2. Railing sleeves: Install under Section 03 10 00
3. Steel railings and guardrails
4. Exterior door stop supports
5. Sidewalk trench drain system
6. All other miscellaneous angles, channels, tubes, and plates as indicated.

B. Related Sections:

1. Unit Masonry: Section 04 20 00
2. Concrete Curbs and Sidewalks: Section 32 16 00
3. Grout: Section 03 60 00
4. Cast-in-Place Concrete: Section 03 30 00

1.02 REFERENCES

- A. Steel: Conform to AISC "Specifications for Architecturally Exposed Structural Steel", latest edition.
- B. Welding: Conform to "AWS Structural Welding Code".

1.03 DEFINITIONS

The term "metal fabrications" is synonymous with the term "miscellaneous metals".

1.04 SUBMITTALS

- A. Product Data: Submit product data for manufactured items in accordance with Section 01 33 00.
- B. Shop Drawings: Submit shop drawings in accordance with Section 01 33 23.

1.05 QUALITY ASSURANCE

Welder Qualifications: Welding shall be performed by AWS certified welding operators.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Materials to be Installed Under Other Sections: Deliver items which are embedded in cast-in-place concrete or masonry construction to the project site in time to be installed before the start of cast-in-place concrete operations or masonry work. Furnish setting drawings, templates, and directions for the installation of embedded items.
- B. Storage of Metals: Metals which are stored at the project site shall be above ground on platforms, skids, or other supports. Protect steel from corrosion. Store other materials in a weather tight and dry place until ready for use. Store packaged materials in their original unbroken package or container.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Steel, Shapes, Bars, and Plates: Conform to ASTM A36, A572 or A992.

- B. Steel Pipe and Tubing: Conform to ASTM A53, A501, or A500, minimum wall thickness 11 gauge.

- E. Shop Paint:
 - 1. Materials:
 - a. Steel Exposed to Weather: Tnemec Series 161-1255 Tnemec-Fascure or approved substitute of other acceptable manufacturer of high-performance coating (refer to Section 09920).
 - b. All other Steel: Tnemec 10-99 primer.
 - 2. Preparation:
 - a. Steel to Receive High Performance Coating (Exterior, exposed to weather): Steel Structures Painting Council SSPC-SP6 Commercial Blast Cleaning.
 - b. All Other Steel: Steel Structures Painting Council SSPC-SP3 Power Tool Cleaning.
 - 3. Application:
 - a. Exterior Fabrications: Spray apply to uniform dry film thickness of 4.0 mils, free of runs, sags or other defects. Omit shop primer within 2" of field welded connections.
 - b. Interior Fabrications: Spray apply to uniform dry film thickness of 2.5 mils, free of runs, sags or other defects. Omit shop primer within 2" of field welded connections, compression joint surfaces, steel embedded in concrete and steel to be covered by spray on fireproofing.

2.02 FABRICATION

- A. General: Fabricate in accordance with details and approved shop drawings all miscellaneous items of metal work indicated or as necessary to complete the work.
 - 1. Materials shall be new stock of types and sizes indicated.
 - 2. Make cuts clean and sharp with edges ground smooth.
 - 3. On completion, the work shall be straight, rigid and tight, and free from defects.
 - 4. Close exposed ends of steel pipe, channel, or tubing with welded steel plate caps.

- B. Welding: Comply with latest American Welding Society Standards. Miter and cope intersections and weld all around. Remove splatter and grind exposed welds to blend and contour surfaces to match those adjacent.

2.03 STEEL ANGLE LINTELS

Furnish miscellaneous loose steel angle lintels for openings of sizes and bearings indicated and scheduled.

2.04 CHECKERED PLATE (Trench Drain Assembly)

Checkered steel plate, 1/4" thickness, galvanized by the hot-dipped method. All components of the trench drain assembly shall be hot-dip galvanized. Do not prime paint.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Weld or bolt items securely in place or otherwise fasten as indicated on the drawings or approved shop drawings.

- B. Grind field welds smooth and touch-up with the appropriate primer to match the shop primer.

- C. Where railings are to be set in concrete, set railing posts in cast-in-place sleeves with grout in accordance with Section 03 60 00.

END OF SECTION

DIVISION 6 WOOD AND PLASTICS
SECTION 06 10 00 ROUGH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rough Hardware
2. Framing Lumber
3. Plywood Sheathing

B. Related Sections:

1. Concrete Forms and Accessories: Section 03 10 00
2. Finish Carpentry: Section 06 20 00
3. Custom Casework: Section 06 41 00
4. Flashing and Sheet Metal: Section 07 62 00
5. Gypsum Board Ceilings: Section 09 21 10
6. Plastic Laminate Faced Casework: Section 12 32 00
7. Mechanical and Electrical: Division 23 and Division 26

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Wood Framing: Comply with requirements of International Building Code and "National Design Specification for Wood Construction", latest edition, as published by American Forest and Paper Association.
2. Lumber: Comply with Standard Grading Rules for Western Lumber, latest edition, published by Western Wood Products Association. Each piece of lumber shall be grade stamped.
3. Plywood: Comply with U.S. Product Standard PS 1-07 for Construction and Industrial Plywood. Each panel shall be identified with the grade trademark of the APA- Engineered Plywood Association.
4. Treated Wood: Comply with the Standards of the American Wood Preservers Association (AWPA) as referenced herein.

1.02 DELIVERY, STORAGE AND HANDLING

Store material off the ground and cover with waterproof covering.

PART 2 - PRODUCTS

2.01 ROUGH HARDWARE

A. Provide necessary bolts, screws, nails, clips, plates, straps, hangers, etc., required for the completion of rough carpentry. Hardware shall be correct material of proper size and strength for the purpose intended and shall conform to the requirements of this Specification, the notes on the drawings, and all applicable building codes. Exterior hardware and items embedded in concrete or masonry or in contact with treated wood shall be galvanized.

B. Anchor bolts indicated to be built into concrete or masonry for support of wood framing shall be provided under this Section and installed under Section 03 30 00 and 04 20 00.

2.02 FRAMING LUMBER

A. Studs:

1. Hem-Fir or Spruce Pine-Fir
2. Stud Grade or Construction Grade.

- B. Plates:
 - 1. Hem-Fir, Spruce Pine-Fir
 - 2. Standard Grade or Better.

- C. Joists and Headers:
 - 1. Hem-Fir, Spruce Pine-Fir
 - 2. No. 2 Grade or Better.

- D. Blocking and Furring:
 - 1. Hem-Fir, Spruce Pine-Fir
 - 2. Standard Grade or Better.

2.03 PLYWOOD

- A. Sheathing: C-D, Exposure 1, APA rated sheathing, thickness as shown on the drawings.
- B. Equipment Mounting Backboard: B-C grade, 3/4" thickness.

2.04 PRESERVATIVE TREATMENT

- A. All framing lumber which is in contact with the concrete slab shall be pressure treated with CCA preservative (Type C in accordance with AWPA Standard P5) in conformance with AWPA Standards C1, C2, and C9. Preservative treated wood shall be kiln-dried after treatment to a maximum of 19% moisture content and shall bear the third-party stamp "LP-2" for "Above Ground Use".
- B. Acceptable Manufacturers and Products:
 - 1. Wolmanized by Köppers
 - 2. Dixie CCA by Köppers
 - 3. CCA by Hoover Treated Wood Products, Inc.
 - 4. or approved substitute

2.05 ADHESIVES

APA approved adhesives.

PART 3 - EXECUTION

3.01 EXAMINATION

Verify that surfaces to receive rough carpentry are prepared to required grades and dimensions.

3.02 INSTALLATION

- A. Plywood Roof Sheathing: Install directly over top chords of wood roof trusses with long dimension of panels perpendicular to the longitudinal axis of the truss members. Install full sheets of 4'x8' plywood to the greatest extent possible while laying out panels so that no individual panel has an area less than 16 ft.² and no dimension in plane less than 24". Panels shall be installed with end joints staggered 4'-0" from adjacent rows of panels. Maintain 1/8" joint spacing between panels unless otherwise recommended by plywood manufacturer. Ensure that each plywood panel has proper end/edge bearing. Securely attach panels to top chord of wood trusses with #8 "Grabber Plywood Screws" with "Grabbergard" coating (John Wagner Associates, Inc., Grabber Division, 205 Mason Circle, Concord, CA 94520) or equivalent. Spacing of screws shall be 6" maximum o.c. along panel end and side edges (panel perimeter), and 6" maximum o.c. along truss chords in the field of panels. Length of screws shall be sufficient to penetrate truss chord members at least 7 screw diameters (1 1/4" for #8 screws). If required to prevent splitting of wood members, predrilled in accordance with relevant building code requirements and manufacturer's instructions. Install screws in full accordance with

manufacturer's printed instructions. At panel end edges, offset screws from screws in adjacent panels.

- B. **Plywood Wall Sheathing:** Install directly over structural wood studs, (or over gypsum sheathing on structural studs if indicated on the drawings). Install with long dimension of panels perpendicular to direction of stud span. Vertical joints between panels shall occur only at a stud location. Panels shall be installed with end joints staggered 4'-0" from adjacent rows of panels. Securely attach panels to wood studs with #8 "Grabber Plywood Screws" with "Grabbergard" coating (John Wagner Associates, Inc., Grabber Division, 205 Mason Circle, Concord, CA 94520) or equivalent. Spacing of screws shall be 6" maximum o.c. along panel end and side edges (panel perimeter), and 12" maximum o.c. in the field of panels. Length of screws shall be sufficient to penetrate wood stud at least 7 screw diameters (1 1/4" for #8 screws). If required to prevent splitting of wood members, predrilled in accordance with relevant building code requirements and manufacturer's instructions. Install fasteners in accordance with manufacturer's instructions and maintain sufficient distance from panel end and side edges to assure full development of connection strength. Offset fasteners at panel end edges from fasteners in adjacent panels. Maintain 1/8" joint spacing between panels unless otherwise recommended by sheathing manufacturer.
- C. Install solid wood blocking or plywood in stud space within gypsum board partitions for attachment of wall stops, cabinets, and other wall mounted accessories. Contractor shall verify mounting requirements of cabinets and accessories to ensure adequate blocking is provided within partitions. (Minimum 8" wide 16 gauge sheet metal continuous across the face of studs is an acceptable alternative to wood blocking.)
- D. **Equipment Mounting Backboard:** 4'x 8' sheets laid horizontally across wall. Fasten to stud framing or masonry as required to support equipment loads, but not less than no.8 screws at 16" on center in the field and along edges of the board.
- E. **Framing that comes in contact with concrete slab:** Framing for all portions of the work shall be performed in substantial manner consistent with accepted standards of the carpentry trade. Erect framing plumb, level and true, and rigidly anchor in place. Locate studs 16" on center except where indicated otherwise.
1. Anchor plates at bearing as indicated. Unless otherwise indicated, bolt plates firmly to concrete or masonry with 1/2" x 10" (7" embedment) anchor bolts at 4'-0" on center and maximum 12" from corners and end of plates.

END OF SECTION

SECTION 06 17 53 PREFABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Shop Fabricated Wood Trusses.
- B. Related Sections:
 - 1. Rough Carpentry: Section 06 10 00

1.02 REFERENCES

- A. Wood Framing: Requirements of UBC and "National Design Specifications for Wood Construction", current edition as published by National Forest Products Association.
- B. Lumber: Grading Rules for Western Lumber published by Western Wood Products Association. Each piece of lumber shall be grade stamped.

1.03 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Sections 01 33 00 and 01 33 23. Indicate truss framing plans, pitch, span, and spacing of trusses; gauge thickness, nominal sizes and locations of connectors at joints; bearing and anchorage details; framed openings; permanent bracing and bridging and related items. Shop drawings shall be stamped with fabricator's design engineer's seal.
- B. Quality Control Submittals:
 - 1. Design Calculations: Submit fabricator's design engineer's calculations with Shop Drawings indicating species and grades of lumber used, design loading and allowable stress increase, force analysis of each member and design of each connection.
 - 2. Fabricator's Instructions: Submit fabricator's instructions for lateral bracing in accordance with Section 01 60 00.

1.04 QUALITY ASSURANCE

- A. Design of Trusses: Designed by Colorado registered professional engineer employed by truss fabricator according to dimensions and design loads indicated.
- B. Manufacturer qualifications: Engage a firm experienced in producing prefabricated structural wood similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the work.
 - 1. Open-web trusses shall be manufactured in a plant listed in ICC ES Legacy Report No. PFC-4354 and under the supervision of a third-party inspection agency.
- C. Prefabricated structural wood products shall be design and manufactured in accordance with the standards set forth in the ICC ES report appropriate for the specific product manufacturer.

1.05 DELIVERY, STORAGE AND HANDLING

Comply with Section 01 60 00. Store and handle trusses in vertical position. Store off ground and under waterproof covering in accordance with fabricator's recommendations.

PART 2 - PRODUCTS

2.01 TRUSS MATERIALS

- A. Lumber: Kiln-dried, species and grade as required by fabricator's design engineer. Where minimum sizes are shown on the drawings, these sizes shall be part of the truss design.
 - B. Truss Hardware: Provide necessary bolts, nuts, washers, steel plates, nails, etc., necessary for truss fabrication. Use correct material of proper size and strength for purpose intended in accordance with notes on Drawings and applicable building codes.
 - C. Supports and Anchors Manufacturers:
 - 1. Simpson
 - 2. Teco
 - 3. approved substitute
- 2.02 OPEN-WEB TRUSSES
- A. Materials shall comply with ICC ES appropriate for specific truss manufacturer. Chord members, web members, connecting pins and bearing hardware and attachments shall be of material and size as required by design.
 - B. Fabrication tolerances: Fabricate all open-web trusses to dimensions as indicated on drawings and to the following tolerances:
 - 1. Length from bearing to bearing:
 - a. Trusses up to 30-feet long: Plus or minus 1/8-inch.
 - b. Trusses over 30-feet long: Plus or minus ¼-inch.
 - 2. Depth: Plus or minus 1/8-inch.
 - 3. Camber:
 - a. Trusses up to 30-feet long: Plus or minus 1/8-inch.
 - b. Trusses from 30-feet to 60-feet long: Plus or minus 3/8-inch.
 - c. Trusses over 60-feet long: Plus or minus ½-inch.
- 2.03 FABRICATION
- Fabricate in shop accurately cut to length, angle, and true to line for tight joints in accordance with approved shop drawings. Trusses shall be fabricated to the chord and web configuration shown on drawings. Deviations shall not be made without prior written approval from Architect.
- PART 3 - EXECUTION
- 3.01 EXAMINATION
- A. Verification of Conditions: Comply with Section 01 60 00:
 - 1. Layout: Verify layout of work before beginning installation.
 - 2. Existing Conditions: Verify support elements are installed at proper locations and elevations.
 - 3. Notification: Notify Contractor of unsatisfactory conditions in writing with copy to Architect.
 - B. Acceptance: Beginning of work indicates acceptance of existing conditions by installer.
- 3.02 ANCHORS AND SUPPORTS
- Provide and install rough hardware and metal fastenings as indicated, specified, and required for proper installation of trusses. Provide nails, spikes, screws, and bolts and similar items of sizes and types to properly secure members in place.
- 3.03 TRUSS ERECTION
- Hoist trusses into position taking care to prevent out-of-plane bending. Set and secure trusses level, plumb, and in correct locations.

1. Provide temporary bracing and anchorage to hold trusses in place until permanently secure. Ensure truss end have sufficient bearing area. Install permanent bracing and bridging prior to application of loads.
2. Field modifications of members not allowed.

END OF SECTION

SECTION 06 20 00 FINISH CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior Trim
2. Window Sills

B. Related Sections:

1. Rough Carpentry: Section 06 10 00
2. Plastic Laminate Faced Casework: Section 12 32 00
3. Prefinished Wood Doors: Section 08 14 29
4. Painting: Section 09 91 00

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Conform to the Custom Grade and Installation requirements of the "Architectural Woodwork Quality Standards and Guide Specifications", current edition, as published by the Architectural Woodwork Institute.
2. Conform to the Grading Standards of the National Hardwood Lumber Association

1.02 REFERENCES

Reference Standards:

1. Conform to the Custom Grade and Installation requirements of the "Architectural Woodwork Quality Standards and Guide Specifications", current edition, as published by the Architectural Woodwork Institute.
2. Conform to the Grading Standards of the National Hardwood Lumber Association.

1.03 DEFINITIONS

Finish carpentry is generally defined as woodwork requiring a smooth finish and exposed to view but not considered as shelving, cabinets, counters, or casework.

1.04 DELIVERY, STORAGE AND HANDLING

Do not deliver material until the building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.

PART 2 - PRODUCTS

2.01 INTERIOR TRIM MATERIAL

A. All trim material shall be one of the following, as indicated on the drawings:

1. Interior Trim – Opaque Finished (Painted): Yellow poplar, #1 Common Grade, Plain Sawn.
2. Interior Trim- Opaque Finished (Painted): Rough Sawn Cedar Fascia trim 2 x 10.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all work required in this section per AWI Quality Standards, current edition.

- B. Interior Finish: Wherever possible, each length of finish shall be in single piece. No butt joints will be allowed except for long pieces or room molds which may be in two or more sections, when necessary, with beveled joints.
- C. Install interior finish level, plumb and true and tightly secure to backing with nails, screws, glue, etc. Blind nail wherever possible. Where surface nailing is necessary, use finish nails carefully set with nail punch. Finish bearing hammer marks, splits, cracks, mars or defects of any nature will be ordered replaced.
- D. Trim finishing against walls or ceiling shall be milled with extra width to permit scribing to wall or ceiling at job.
- E. Except where molded, all trim shall be milled with perfectly square edges. After erection the exposed edges shall be slightly rounded by sanding as directed.
- F. All finish shall be hand smoothed, ready for finish and absolutely free from machine or tool marks or any roughness whatever.

END OF SECTION

SECTION 06 41 00 CUSTOM CASEWORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Custom manufactured wood, plastic laminate faced and / or wood casework not furnished under Section 12 32 00.
2. Solid Surface Lavatory Countertops

B. Related Sections:

1. Metal Fabrications: Section 05 50 00
2. Rough Carpentry: Section 06 10 00
3. Finish Carpentry: Section 06 20 00
4. Prefinished Wood Doors: Section 08 14 29
5. Painting: Section 09 91 00
6. Plastic Laminate Faced Casework: Section 12 32 00

1.02 QUALITY ASSURANCE

A. Reference Standards:

1. Material and workmanship shall conform to the Custom Grade requirements of "Architectural Woodwork Quality Standards", current edition, as published by the Architectural Woodwork Institute. Where more stringent requirements are desired, they are specifically noted.

1.03 DEFINITIONS

Custom casework is defined as custom fabricated counters, cabinets, casework, and shelving. Other woodwork not considered as such is considered finish carpentry and is specified under Section 06 20 00. Stock fabricated casework is specified under Section 12 32 00.

1.04 SUBMITTALS

- ##### A. Shop Drawings:
- Submit shop drawings for all items under this Section in accordance with Sections 01 33 00 and 01 33 23. Where selected plastic laminate color / pattern is directional, indicate pattern direction. Pattern direction across door and drawer fronts shall be vertical, and must align and match vertically.

B. Samples:

1. Submit a complete set of plastic laminate samples including all available solids, matrix, nebulas, and wood grains for Architect's color selection, except metallic colors.
2. Submit a complete set of solid surface samples including all available solids and patterns for Architect's color selection.
3. Submit full range of PVC edge samples including solids, matrix, nebulas, and wood grains for Architect's color selection. (Approximately 250 colors for 1mm edging and approximately 25 colors for 3mm edging.)

1.05 DELIVERY, STORAGE AND HANDLING

Do not deliver custom casework until the building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Plastic Laminate Manufacturers (Manufacturer to be same as manufacturer of plastic laminate for cabinets manufactured under Section 12 32 00):
 - 1. Formica
 - 2. Wilsonart
 - 3. Nevamar
 - 4. Laminart
 - 5. or approved substitute

- B. Trim Material: Trim material shall be free of defects to the extent required by AWI Custom Grade allowances for the species used. Trim material shall be one of the following as indicated on the drawings:
 - 1. Opaque Finished (Painted): Yellow poplar, #1 Common Grade, Plain Sawn.
 - 2. Transparent Finished (Stained): Red Oak, Select Grade, Plain Sawn.

- C. Plywood: Plywood used in custom casework shall be as follows or as indicated on drawings:
 - 1. Core: Lumber or Medium Density Industrial (minimum average 45 lb. / cu. Ft.) Particleboard, minimum 3/4" thick, meeting ANSI 208.1 Specifications, containing no added urea-formaldehyde resins.
 - 2. Face Veneer (exposed): HPVA Grade A plain sliced red oak.
 - 3. Balance Veneer (exposed): HPVA Grade A plain sliced red oak.
 - 4. Balance Veneer (concealed): Best price plain sliced red oak.
 - 5. Edges: Veneer to match Exposed Face.

- E. Plastic Laminate Faced Casework:
 - 1. Exposed Surfaces (Including Inside Surfaces of Open Shelving Units): Comply with NEMA LD-3 Performance Test, vertical grade, High Pressure Decorative Laminate .030" thick.
 - 2. Semi-Exposed (Backs of doors and Inside Surfaces of Cabinets with Doors): Melamine Laminate .020" thick, cabinet liner type. Painted surfaces not acceptable. Color: Light Beige or Dove Gray.
 - 3. Concealed Surfaces: Melamine Laminate, .020" thick, liner or backer type.
 - 4. Exposed Edges: Exposed cabinet body edges shall be covered with 1 mm PVC edge-banding. Plastic laminate is not acceptable. Door and drawer front edges shall be covered with 3 mm PVC edge-banding. PVC edge-banding must be applied with hot melt glue, no exceptions. A maximum of four colors may be selected.

- F. Cabinet Hardware:
 - 1. Hardware for custom cabinets and casework shall be provided under this Section and, unless otherwise shown, shall conform to Section 12 32 00, 2.02.
 - 2. Backpack Hooks, where indicated as such, shall be double prong coat hooks Ives #580 or Trimco #3030.

- G. Solid Surface Countertops: Corian, as manufactured by DuPont, or approved substitute. Tops, backsplash, and apron shall be 1/2" thick, homogeneous material, not coated or laminated. Color and pattern as selected by Architect from full range of manufacturer's colors within "Price Group A and B".

- H. Wall Hung Adjustable Shelving: Refer to Section 12 32 00.

- I. Exposed Fasteners: Shelving standards fasteners shall be flat head, size appropriate to be countersunk and finish to match standard. Access and closure panel fasteners shall be oval head set in finish washer; size appropriate to fastener, finish shall be US26.

- J. Conduit Sleeves: Doug Mockett EPD3, plastic 2-1/2" flip-top grommet set in top of work stations.

2.02 FABRICATION

- A. Construct custom casework to dimensions, profiles, and details shown on the drawings and herein specified, meeting Architectural Woodwork Institute Quality Standards, current edition, to specified grade for workmanship.
- B. Construct red oak shelving, counters, cabinets, and casework indicated on the drawings using red oak plywood with exposed edges banded with red oak veneer.
- C. All shelving, cupboards, counters; cabinets and casework other than red oak shall receive enamel or other opaque finish and shall be constructed with particle board as indicated with all exposed edges banded with birch. Shelf cleats, supports, stiles, rails, etc., shall be 3/4" yellow poplar unless otherwise indicated.
- D. Frame cabinets and casework in a substantial manner with necessary blocking, braces, and bottoms. Frame shall be pinned, glued, or screwed together in accordance with AWI Custom Grade Standards.
- E. Where selected plastic laminate color / pattern is directional, direction of pattern shall be vertical and all exposed faces and fronts (doors and drawers) shall match. Transparent finished wood shall have grain direction meeting AWI Quality Standards, current edition, Custom Grade.
- F. Countertops covered with plastic laminate shall be constructed of Medium Density Industrial (minimum average 45 lb. / cu. Ft.) Particleboard, minimum 1" thick, meeting ANSI 208.1 Specifications, containing no added urea-formaldehyde resins. Provide 3 mm PVC edging, hot melt glue applied, on front and backsplash edges. Refer to Section 12320 for additional requirements.
- G. Solid surface countertops shall be manufactured of specified material to dimensions shown. Solid tops shall be continuous without joints to the greatest extent possible. Where joints are required, they shall be placed as indicated on approved shop drawings. Provide cutouts for sinks as required, coordinate with Division 15.
- H. Finish: Where wood is detailed as the exposed finish material on custom casework, it shall be Shop Finished to specifications no less than that called out for painted or stained wood in Section 09 91 00.

PART 3 - EXECUTION

3.01 EXAMINATION

Prior to fabrication and installation, verify adequacy and location of blocking and support framing for this section's work. Verify locations and conditions of mechanical, electrical, plumbing etc. items effecting the installation of the work.

3.02 BASES AND SUPPORTS

Construct bases for cabinets as indicated, securely anchored to the floor. Rubber base shall be provided as specified under Section 09 65 00.

3.03 INSTALLATION

- A. Installation shall meet the appropriate grade requirements set forth in AWI Quality Standards, current edition, section 1700.
- B. Solid surface countertops shall be installed over appropriate supporting substrate, as detailed and per approved shop drawings.

END OF SECTION

SECTION THERMAL AND MOISTURE PROTECTION
SECTION 07 13 00 SHEET MEMBRANE WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Foundation wall waterproof membrane, self adhered.
- B. Related Sections:
 - 1. Concrete Forms and Accessories: Section 03 10 00
 - 2. Cast-in-Place Concrete: Section 03 30 00
 - 3. Fluid Applied Waterproofing: Section 07 14 00

1.02 SUBMITTALS

- A. Product Data: Submit to the Architect copies of manufacturer's specifications covering the complete installation of the membrane.
- B. Samples: Submit with manufacturer's specifications a 12" x 12" sample of the membrane to be used.
- C. Shop Drawings: Submit in accordance with Sections 01 33 00 and 01 33 23. Submit details showing product in proposed actual project application. Generic manufacturer's details do not meet this requirement.
- D. Contract Closeout Submittals: Submit warranty specified under Article 1.06.

1.03 QUALITY ASSURANCE

- A. Applicator Qualifications: Application shall be by factory authorized applicator.
- B. Manufacturer's Representative: Work shall be supervised by an authorized manufacturer's representative who shall be on the job site during application.

1.04 DELIVERY, STORAGE AND HANDLING

Do not deliver materials to the site until ready for use. Deliver accessory materials (adhesives, tape, sealants, etc.) in manufacturer's original unopened containers.

1.05 PROJECT CONDITIONS

Environmental Requirements: Do not install membrane when the temperature is below 50 degrees F.

1.06 WARRANTY

Provide installer's written five (5) year warranty, commencing from the date of issuance of the Owner's Letter of Acceptance, agreeing to repair or replace waterproofing system and its installation if it leaks water, becomes permeable to water vapor, deteriorates, or otherwise fails to perform as required due to failure of workmanship.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers and Products:
 - a. Grace PrePrufe 300R
 - b. or approved substitute

1. Membrane: Composite sheet comprising an HPDE film, pressure sensitive adhesive, and a weather resistant protective coating. Minimum HPDE thickness shall not be less than 0.030 inches. Detailing Compound as required for complete waterproof installation.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Examine surface to receive membrane prior to beginning application to assure that they are dry and free from conditions that will adversely affect the execution and quality of work. Do not start work until unsatisfactory conditions are corrected and work which penetrates membrane is completed.

3.02 PREPARATION

Surface Penetration: Surface to receive membrane shall be smooth free from protrusions, which may injure or puncture membrane.

3.03 INSTALLATION

Membrane Waterproofing: Install at locations indicated in the construction documents. Insure sheet is clean, dry and free from contamination. Install in full compliance with manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

Inspection: Membrane shall not be covered until examined by the Architect and qualified factory representative.

END OF SECTION

SECTION 07 21 00 BUILDING INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rigid Insulation
2. Wall Batt Insulation
3. Roof Batt Insulation
4. Loose Fill Insulation
5. Spray Foam Insulation (at windows)
6. Insulated Sheathing
7. Blown in Insulation
8. Installation Accessories

B. Location of Work:

1. Rigid Insulation:
 - a. Perimeter of exterior foundation walls.
 - b. Elsewhere as indicated.
2. Wall Batt Insulation:
 - a. Exterior stud walls and fascia where indicated.
 - b. Soffits where indicated.
 - c. Elsewhere as indicated.
3. Roof Batt Insulation:
 - a. Attic where indicated.
4. Loose Fill Insulation:
 - a. Exterior block walls.
5. Spray Foam insulation:
 - a. At windows where indicated.
6. Insulated Sheathing:
 - a. Exterior walls where indicated.
7. Blown in Insulation:
 - a. Attic where indicated.

C. Related Sections:

1. Wood Siding: Section 07 46 23
2. Gypsum Board Partitions and Walls: Section 09 21 00
3. Mechanical: Division 23

1.02 SUBMITTALS

Submit product data of each component and material to be furnished under this Section in accordance with Sections 01 33 00 and 01 33 23.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver thermal wall materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and installation.
- B. Store, protect and handle thermal wall materials in accordance with the manufacturer's recommendations to prevent damage, contamination and deterioration. Keep materials free of dirt and other foreign matter.

1.04 PROJECT CONDITIONS

- A. Environmental Requirements: Install thermal wall materials only when weather conditions are in compliance with manufacturer's specific environmental requirements and conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

PART 2 - PRODUCTS

2.01 WALL AND FOUNDATION RIGID INSULATION

- A. Acceptable Manufacturers and Type:
1. Owens Corning Foamular 250
 2. GreenGuard Type IV 25 PSI, Pactiv Building Products
 3. or approved substitute
- B. Rigid Insulation: 2" thickness, 48" wide, extruded polystyrene sheets conforming to ASTM C578-type X, with minimum R-value of 5.0 per inch thickness when tested in accordance with ASTM C518. Compressive strength minimum 25 psi.
1. ¾" thickness at under slab location.
- C. Adhesive: As recommended by rigid insulation manufacturer.

2.02 WALL BATT INSULATION

- A. Acceptable Manufacturers:
1. Owens-Corning
 2. Johns-Manville
 3. Zonolite
 4. CertainTeed
 5. Knauf
 6. or approved substitute
- B. Batt Insulation: Batts or blanket with flanges. Widths to fit stud spacing. Use Class A FSK foil faced, flame spread rating of 25 or less. Minimum R-value as follows:
1. 3-1/2" thick material rated R-13 for 3-5/8" or 4" stud walls.
 2. 6" thick material rated R-19 for 6" stud walls and soffits.

2.03 ROOF BATT INSULATION

- A. Acceptable Manufacturers:
1. Owens-Corning
 2. Johns Manville
 3. CertainTeed
 4. Knauf
 5. or approved substitute
- B. Roof Batt Insulation: Foil-reinforced kraft vapor barrier face with flame spread rating of 25 or less on plenum side of insulation. Minimum R-value shall be R-19 with 6" material thickness.
- B. Anchoring System: 16 gauge wire or impaling pin system, standard of manufacturer to secure insulation to bottom-side of roof deck.

2.04 LOOSE FILL INSULATION

- Acceptable Manufacturers and Products:
1. W. R. Grace Zonolite Vermiculite
 2. Persolite Perlite Loose Fill Masonry Insulation

3. Permalite Perlite Loose Fill Masonry Insulation
4. or approved substitute

2.05 SPRAY FOAM INSULATION (at windows)

- A. Acceptable Manufacturers and Products:
 1. Touch-n-Foam "NoWarp" window and door sealant
 2. Dow GREAT STUFF
 3. CR Laurence Handi-Foam
 4. or approved substitute

- B. Spray foam insulation: Low pressure expanding polyurethane foam designed to seal cavity without exerting pressure on the surrounding materials.

2.06 INSULATING SHEATHING

- A. Acceptable Manufacturers and Type:
 1. Dow – "THERMAX ci Exterior Insulation System"
 2. RMax – "ECOMAXci continuous Insulation for Exterior Walls System"
 2. or approved substitute

- B. Insulated Sheathing: Glass-fiber reinforced enhanced polyisocyanurate foam core sheathing faced with nominal 4 mil embossed white or blue acrylic-coated aluminum on one side and 1.25 mil embossed aluminum on the other side, complying with ASTM C1289 and meeting the following physical properties:
 1. ASTM C1289 Type 1, Class 1
 2. Flame Spread (ASTM E84, Class A): 25 or less.
 3. Smoke Developed (ASTM E84, Class A): 450 or less.
 4. Compressive Strength (ASTM D1621): 25 psi, minimum.
 5. Long-Term Thermal Resistance (ASTM C518): R-6.5 per 1 inch of thickness with 15 year thermal warranty.
 6. Flexural Strength (ASTM C203): Minimum 40 psi.
 7. Water Absorption (ASTM C209): Maximum.1.0 percent by volume.
 8. Water Vapor Permeance (ASTM E96): <0.3 perms.
 9. Maximum Use Temperature: 250 degrees F.

- C. Panel Size: 48" x 96" sheet. Square edge. 2" Thick.

2.07 CELLULOSE BLOWN IN INSULATION

- Acceptable Manufacturers and Products:
1. Green Fiber Cellulose Blown in Insulation
 2. or approved substitute

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive insulation to assure conditions are satisfactory for installation.

- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

- C. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

- A. Rigid Insulation:

Foundations: Apply insulation board to substrate using adhesive methods recommended by the manufacturer. Install boards over exterior face of foundation walls or waterproofing from

top of footing or minimum depth of 3'-0" below grade on walls to within 6" of finish grade. Secure insulation panels with adhesive applied to the back of panels. Edges should be tightly butted and vertical joints staggered. Backfill carefully to prevent damage to insulation.

- B. Blanket or Batt Insulation: Fit tight to adjoining work and adjoining insulation so that a completely tight enclosure free from open joints, holes, cracks, and voids, is achieved. Tape batt flanges to interior face of steel studs to form continuous vapor barrier. Attach insulation in place in a manner ensuring stability and to eliminate sagging.
- C. Roof Batt Insulation: At new entry lobby only. Secure insulation to bottom-side of roof deck with criss-cross wire system installed diagonally at 18" on center or impaling pins secured to metal deck with washers at manufacturer's recommended spacing. Tape joints between insulation with foil tape to form continuous vapor barrier.
- D. Loose Fill Insulation: Pour loose fill insulation directly into CMU cavities from bags. Coordinate work to ensure completely full cores. Place fill in void cavities of all exterior concrete masonry unit walls, which enclose conditioned space.
- E. Spray Foam Insulation (at windows): Spray insulation into gaps around exterior door and window frames. Use per manufacturer's recommendations taking care not to overfill cavity. Protect door and window frames and surrounding surfaces from overspray.
- F. Insulated Sheathing: Apply sheathing board to exterior face of wood studs using methods recommended by the manufacturer. Tongue and groove or shiplap edges shall fit tightly together, with panel joints falling on the studs. Completely cover insulated sheathing with weather resistive barrier. Attach weather resistive barrier to insulated sheathing using materials and methods approved by the manufacturer. Reference Section 07 25 00.
- E. Blown in Insulation: Spray insulation into attic areas affected by work and as indicated on the drawings

END OF SECTION

SECTION 07 25 00 WEATHER RESISTIVE BARRIER

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Weather Barrier Membrane
2. Seam Tape
3. Flashing
4. Fasteners

B. REFERENCES

1. ASTM International
 - a. ASTM C 920; Standard Specification for Elastomeric Joint Sealants
 - b. ASTM C 1193; Standard Guide for Use of Joint Sealants
 - c. ASTM D 882; Test Method for Tensile Properties of Thin Plastic Sheeting
 - d. ASTM D 1117; Standard Guide for Evaluating Non-woven Fabrics
 - e. ASTM E 84; Test Method for Surface Burning Characteristics of Building Materials
 - f. ASTM E 96; Test Method for Water Vapor Transmission of Materials
 - g. ASTM E 1677; Specification for Air Retarder Material or System for Framed Building Walls
 - f. ASTM E 2178; Test Method for Air Permeance of Building Materials

C. AATCC – American Association of Textile Chemists & Colorists

1. Test Method 127 Water Resistance: Hydrostatic Pressure Test

D. TAPPI

1. Test Method T-460; Air Resistance of Paper (Gurley Hill Method)
2. Test Method T-410: Grams of Paper and Paperboard (Weight per Unit Area)

1.02 SUBMITTALS

A. Submit product data of each component and material to be furnished under this Section in accordance with Sections 01 33 00 and 01 33 23.

B. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

C. Quality Assurance Submittals:

1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.
2. Manufacturer Instructions: Provide manufacturer's written installation instructions.
3. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation.

D. Closeout Submittals

1. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

1.03 QUALITY ASSURANCE

A. Qualifications

1. Installer shall have experience with installation of DuPont™ Tyvek® weather barrier assemblies under similar conditions.
2. Installation shall be in accordance with weather barrier manufacturer's installation guidelines and recommendations.

3. Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.
- B. Mock-up:
1. Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations.
 - a. Mock-up size: 10 feet by 10 feet.
 - b. Mock-up Substrate: Match wall assembly construction, including window opening. Mock-up may remain as part of the work.
 2. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.
- C. Pre-installation Meeting
1. Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and weather barrier manufacturer's designated representative.
 2. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.
- 1.04 DELIVERY, STORAGE AND HANDLING
- A. Deliver weather barrier materials and components in manufacturer's original unopened, undamaged containers with identification labels intact.
 - B. Store weather barrier materials as recommended by the manufacturer.
- 1.05 WARRANTY
- A. Submit a written warranty in accordance with Section 01 77 00.
 1. Weather barrier manufacturer's warranty for weather barrier for a period of ten years from date of Substantial Completion.
 2. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.

PART 2 - PRODUCTS

2.01 MANUFACTURER

1. DuPont Building Innovations
2. Typar – MetroWrap
2. approved substitute

2.02 BASIS OF DESIGN

- A. High-performance, flash spun-bonded olefin, non-woven, non-perforated, secondary weather barrier is based upon DuPont Tyvek "CommercialWrap" and related assembly components.
- B. Performance Characteristics: Air Penetration: 0.001 cfm/ft² at 75 Pa, when tested in accordance with ASTM E 2178. Type I per ASTM E 1677.
 1. Water Vapor Transmission: 10 perms, when tested in accordance with ASTM E 96, Method A.
 2. Water Penetration Resistance: Minimum 280 cm when tested in accordance with AATCC Test Method 127.
3. Basis Weight: Minimum 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.

4. Air Resistance: Air infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
5. Tensile Strength: Minimum 38/35 lbs/in., when tested in accordance with ASTM D 882, Method A.
6. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D 1117.
7. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E 84.
8. Flame Spread: 10, Smoke Developed: 10.

2.03 ACCESSORIES

- A. Seam Tape: DuPont Tyvek Tape as manufactured by DuPont Building Innovations, or equivalent of other approved manufacturer.
- B. Fasteners: Tyvek® Wrap Cap Screws, as manufactured by DuPont™ Building Innovations, or equivalent of other approved manufacturer. Rust resistant screw with 2-inch diameter plastic cap fasteners. Length as recommended by manufacturer for substrate.
 1. Use appropriate cap fastener type (screw, nail, staple) as required for the substrate type, and by manufacturer's installation guidelines.
- C. Sealants: Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions, and are recommended by the weather barrier manufacturer.
- D. Adhesives: Provide adhesive recommended by weather barrier manufacturer.
- E. Primers: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
- F. Flashing: DuPont "FlexWrap", as manufactured by DuPont "Building Innovations": flexible membrane flashing materials, or equivalent of other approved manufacturer, for window openings and penetrations. DuPont "StraightFlash", as manufactured by DuPont Building Innovations, straight flashing membrane materials, or equivalent of other approved manufacturer, for flashing windows

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.02 INSTALLATION - WEATHER BARRIER

- A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations
- B. Install weather barrier prior to installation of windows and doors.
- C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
- D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
- E. Window and Door Openings: Extend weather barrier completely over openings.
- F. Overlap weather barrier
 1. Exterior corners: minimum 12 inches.
 2. Seams: minimum 6 inches.

G. Weather Barrier Attachment:

1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 6 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
2. Apply 4 inch by 7 inch piece of DuPont "StraightFlash", or equivalent of other approved manufacturer, to weather barrier membrane prior to the installation of fasteners or ties of any kind which will penetrate the membrane.

3.03 SEAMING

Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams. Seal any tears or cuts as recommended by weather barrier manufacturer.

3.04 FLASHING

Install weather barrier flashing in accordance with manufacturer recommendations. Refer to the DuPont Flashing Systems Installation Guidelines to prepare and flash window and door openings.

3.05 FIELD QUALITY CONTROL

Notify manufacturer's designated representative to obtain required periodic observations of weather barrier assembly installation.

3.06 PROTECTION

Protect installed weather barrier from damage.

END OF SECTION

SECTION 07 31 13 ASPHALT/ FIBERGLASS SHINGLES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 1. Asphalt/Fiberglass Shingle Roofing
 2. Underlayments

1.02 REFERENCES

- A. Reference Standards: Comply with Asphalt Roofing Manufacturer's Association "Residential Asphalt Roofing Manual", current edition.

1.03 SUBMITTALS

- A. Product Data and Shop Drawings: Submit in accordance with Section 01 33 00 and 01 33 23 for all materials specified in this Section. Include recommendation by manufacturer of nail able face insulation for fastener type and pattern.
- B. Samples: Submit in accordance with Sections 01 33 00 and 01 33 23.
- C. Contractor Closeout Submittals: Submit warranty in accordance with Article 1.06.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with:
 1. Fire Test Classification: UL 790 Class A; ASTM E108, Class A.
 2. Wind Resistance Requirement: UL 997; ASTM D3161
 3. Class A Asphalt Shingles: ASTM D3018, Type 1

1.05 DELIVERY, STORAGE AND HANDLING

Comply with Section 01 60 00. Store materials off ground and cover to prevent exposure to weather.

1.06 WARRANTY

- A. Provide installer's **two (2) year** written warranty covering materials and installation of roofing in accordance with Section 01 77 00.
- B. Provide manufacturer's forty (40) year written material warranty. Provisions of warranty shall cover roof assembly failure up to and including 90 mph wind events in accordance with Section 01 77 00.

1.07 MAINTENANCE

Provide Owner with five (5) percent of total area installed, extra replacement shingles.

PART 2 - PRODUCTS

2.01 FIBERGLASS SHINGLES

- A. Acceptable Manufacturers and Product:
 1. Owens-Corning - TruDefinition Durati
 2. GAF Timberline - Ultra HD
 3. CertainTeed – Landmark Pro
 4. approved substitute

- B. **Manufacturer and Type:** Owens-Corning TruDefinition Duration Shingles, self-sealing laminated fiberglass reinforced UL Class A, or approved substitute of other acceptable manufacturer. 5-5/8" exposure, 13-1/4" x 39-3/8". Color as selected by Architect.

2.02 UNDERLAYMENTS AND ACCESSORIES

- A. **Roofing Nails:** Large flat-head galvanized roofing nail. Length as required to penetrate sheathing, 12 gauge minimum. Staples are not allowed.
- B. **Self-Adhered Underlayment (Ice and Water Damming Shield):** Self-adhered rubberized asphalt waterproofing membrane, minimum of 40 mils thick, 36" wide rolls, Class A rated, complying with ASTM D1970, as manufactured by Owens-Corning, W. R. Grace, or Protecto-Wrap.

2.03 INSULATION

Refer to Section 07 21 00.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. **Verification of Conditions:** Verify layout of work before beginning installation. Verify that work of other trades that penetrates roof deck and flashings has been completed. Examine surfaces for inadequate anchorage, drainage, foreign material, moisture, and unevenness that would prevent the execution and quality of application of roofing system. Notify Contractor of unsatisfactory conditions in writing with copy to Architect.
- B. **Acceptance:** Beginning of work means acceptance of existing conditions by installer.

3.04 PREPARATION

- B. **Underlayments:** Apply underlayment to wood decking as indicated. Apply self-adhered underlayment at eaves and valleys, full width of roll.

3.05 SHINGLING

- A. **General:** Comply with Residential Asphalt Roofing Manual and apply in accordance with manufacturer's recommendations.
- B. **Shingles:** Lay in horizontal courses with 5-5/8 inch exposure and two (2) inch minimum head lap.
 1. **Each Course:** Break joints with preceding one.
 2. **Exposed Nails:** Permissible only in top courses where unavoidable. Cover exposed nailheads with elastic cement spread thickly over exposed surface of under courses of shingles, nailed securely in place and pointed with elastic cement.
 3. Neatly fit shingles around any pipes, ventilators, etc.
 4. Coordinate installation of metal flashings furnished in Section 07600 with shingle roof installation.
 5. **Shingles Overlapping Sheet Metal Work or Flashing:** Place nails to avoid puncturing flashing wherever possible.
- C. **Completed Roofing:** Shingles must be sound, whole, and clean. Installation must be acceptable to roofing manufacturer for specified warranty.

END OF SECTION

SECTION 07 42 13 METAL BUILDING PANELS - BAKED ENAMEL FINISH

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Insulated baked enamel faced panels for window wall glazing.
- B. Related Sections
 - 1. Joint Sealers: Section 07 92 00
 - 2. Steel Doors and Frames: Section 08 11 00
 - 3. Aluminum Storefronts: Section 08 43 13
 - 4. Glazing Section 08 80 00

1.02 SUBMITTALS

- A. Color Samples: Submit baked enamel color charts for initial selection by Architect. Submit three (3) 4" x 6" actual sample of each selected color, or colors, to Architect for final approval.
- B. Shop Drawings: Provide shop drawings for baked enamel panels and accessories in accordance with Sections 01 33 00 and 01 33 23.

1.03 DELIVERY, STORAGE AND HANDLING

Comply with Section 01 60 00. Deliver baked enamel panels in original packaging and store undercover, protected from moisture and damage.

PART 2 - PRODUCTS

2.01 BAKED ENAMEL BUILDING PANELS

- A. Manufacturers:
 - 1. Mapes Industries, Inc.
 - 2. or approved substitute
- B. Panel Materials: Insulated baked enamel faced panels for window wall glazing.
 - 1. Total Panel Thickness: 1".
 - 2. Outside Face: 0.011 gauge aluminum with baked enamel finish over 1/8" high density tempered hardboard substrate. Custom color as selected by Architect.
 - 3. Insulation: 2 lb. density polystyrene core.
 - 4. Inside Face: 0.011 gauge aluminum with primed finish over 1/8" high density tempered hardboard substrate. Custom color as selected by Architect.
 - 5. Panel Texture: Embossed.

2.02 SEALANT

As specified in Section 07 92 00, color as selected by the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

Do not install panels that have defective surface. Panels that are found by inspection to be defective shall be replaced.

Installer shall inspect and approve surfaces to receive panels before proceeding.

3.02 INSTALLATION

Install materials in strict accordance with the manufacturer's instructions and approved shop drawings.

3.03 CAULKING AND CLEANING

Seal exterior perimeter of panels with sealant applied in strict accordance with manufacturer's direction.

Upon completion, leave baked enamel surfaces thoroughly clean.

END OF SECTION

Not for Construction

SECTION 07 46 23 Wood Siding

PART 1 – GENERAL

1.01 SUMMARY

Section Includes:

1. Plywood Siding and Wood Stud Battens.
2. Hardboard Siding.

1.02 SUBMITTALS

Submit manufacturer's product data and installation instructions in accordance with Sections 01 33 00 and 01 33 23.

C. Samples:

1. Submit three (3) samples of the products indicated below for approval.

1.03 DELIVERY, STORAGE AND HANDLING

Deliver in manufacturer's original unopened wrapped bundles. Store under cover and protect in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 WOOD SIDING

- A. Lap Siding: James Hardie treated exterior grade "Hardie Plank" lap siding or equivalent of other approved manufacturer. Select Cedarmill pattern, Width 7.25", Exposure 6", Length 12' planks, Thickness 5/16". Primed to be field painted.
- B. Vertical Siding: James Hardie "Hardie panel" treated exterior vertical siding or equivalent of other approved manufacturer. Stucco pattern, Size 4' x 8', Thickness 5/16". Primed to be field painted.
- C. Plywood Siding: Plytanium Natural Rough Sawn Untreated Wood Siding Panel by Georgia-Pacific or approved substitute. Nominal thickness 15/32", 4' x 8' panels. Ship lap edge. Exterior Grade.
- D. Soffit Panels: James Hardie "Hardie Soffit" vented smooth soffit panels. 24" wide 1/4" nominal thickness. Primed to be field painted.
- E. Trim Boards: James Hardie "Hardie Trim" fiber cement boards, 4 / 4 rustic, 3/4" x 7 1/4" and 3/4" x 3 1/2" with 3/4" x 2 1/2" batten boards, primed to be field painted.
- F. Underlayment: Reference Weather Resistive Barrier in Section 07 25 00.

PART 3 - EXECUTION

3.01 EXAMINATION

- A Substrate shall be clean, and free of dampness or frost. All areas shall be examined by the applicator before beginning work. Any unsatisfactory condition that would affect proper application or alignment of siding shall be reported to the Contractor before beginning work.

3.02 APPLICATION

- A. Substrate Preparation at Building Exterior: Cover all substrate with weather resistive barrier per installation instructions in Section 07 25 00.

- B. Lap Siding: Install lap siding with 6" exposure per manufacturer's recommendation, with fasteners recommended by lap siding manufacturer. Apply sealant to butted end joints before paint finish.
- C. Vertical Siding: Install vertical siding per manufacturer's recommendation, with fasteners recommended by the siding manufacturer. Paint.
- D. Plywood Siding: Install plywood siding per manufacturer's requirements. Install with finish nails, set nail heads and fill. Paint.
- E. Wood Stud Battens: Install battens as detailed on the drawings. Install with finish nails, set nail heads and fill. Paint.

END OF SECTION

Not for Construction

SECTION 07 52 16 MODIFIED BITUMEN ROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Two Ply, Hot Mopped, SBS Modified Bitumen, Mineral Surfaced Roof System
2. Roofing Insulation System
3. Related Materials and Accessories

B. Related Sections:

1. Flashing and Sheet Metal: Section 07 62 00
2. Building Insulation: Section 07 21 00

1.02 SUBMITTALS

A. Product Data: Submit in accordance with Section 01 33 00. Include manufacturer's specifications covering roofing system materials and methods proposed.

B. Shop Drawings: Submit in accordance with Section 01 33 00. Include locations and details of penetrations and perimeter details. Indicate layout of insulation board, fastener spacing's and flashing details.

C. Quality Control Submittals:

1. Credentials: Prior to starting the roofing, submit certification from roofing manufacturer of applicator approval.
2. Design and Specification Approval: Prior to starting roofing, submit a signed statement from the system manufacturer that the roofing design and specifications are proper for this particular project.

D. Contract Closeout Submittals:

1. Warranty: At completion of work, submit warranty specified under Article 1.06.
2. Manufacturer's Inspection Certificate: Submit prior to Architect's Punch List Inspection as specified in Article 3.05.

1.03 QUALITY ASSURANCE

A. Qualifications: Applicator must be licensed applicator of roofing manufacturer.

B. Record of Work: Keep a record indicating temperature and moisture conditions and the type and location of work being done during each day of roofing operations.

C. Design Criteria:

1. External Fire Resistance: U.L. Class A.
2. Internal Fire Resistance: Factory Mutual Class I.
3. Wind Uplift: Factory Mutual Class I-90.

1.04 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Section 01 60 00.

- B. Storage and Protection; Handle insulation and rolled goods to prevent damage to edges or ends. Store off the ground and keep covered with waterproof covering. Materials that become wet will be subject to rejection. Store all materials in a dry heated area. Replace damaged materials. Do not leave insulation exposed to weather. Do not store roofing materials on roof in excess of material to be installed during daily work period.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Do not expose membrane and accessories to a constant temperature in excess of 180 degrees F.
 - 2. Follow manufacturer's recommendations during cold weather. Do not install roofing and flashing in inclement weather or when 30% chance of rain is forecast.

1.06 WARRANTY

- A. Provide manufacturer's non-pro-rated initial dollar limit total system warranty against defects in materials and workmanship in roofing system including membrane, insulation, fasteners and flashings for a period of ten (10) years from completion of roof in accordance with Section 01 70 00.
- B. Provide roofing subcontractor warranty against defects in material and workmanship for a period of two (2) years from completion of roof in accordance with Section 01700.

PART 2 - PRODUCTS

2.01 MODIFIED BITUMEN ROOFING SYSTEM

- A. Manufacturers:
 - 1. Johns Manville
 - 2. GAF
 - 3. Tamko
 - 4. Firestone
 - 5. approved substitute
- B. Manufacturer and Type: Johns Manville Two Ply Hot Mopped Modified Bitumen Mineral Surfaced Roof System, Specification 2FID or acceptable equivalent of other manufacturer.
- C. Base Ply and Flashing: Johns Manville GlasPly IV glass fiber reinforced sheet or acceptable equivalent of other manufacturer.
- D. Cap Sheet: Johns Manville DynaGlas FR, UL Class A fire resistant, glass web and mat reinforced SBS rubber and asphalt modified bitumen sheet with white ceramic granules, or acceptable equivalent of other manufacturer.
- E. Asphalt: Comply with requirements of ASTM D312, steep grade, Type III. Asphalt primer shall be in accordance with ASTM D41.
- F. Plastic Cement: Asphalt plastic cement conforming to Fed. Spec. SS-CC-153, Type 1.

2.02 COVER BOARD

- A. ASTM C 1177, non-structural, glass mat-faced roof boards with enhanced surface primer treatment to allow uniform spread of adhesives over a non-combustible, water-resistant and silicone-treated gypsum core panel. Thickness shall be a minimum 3/8" or greater as required for FM 1-90 approval.
 - 1. GP DensDeck "Prime"

2.03 ROOF INSULATION

- A. Description: Rigid polyisocyanurate board supplied by the manufacturer of the roof system:
 - 1. Rigid insulation board composed of closed-cell polyisocyanurate foam core laminated to a black glass reinforced mat facer.
 - 2. Shall comply with ASTM C1289, Type II, Class 1, UL Classified and FM Class 1 approved for steel decks meeting FM 4450 and UL 1256.
 - 3. Furnish two (2) equal layers (first layer shall be a minimum of 1.0") totaling R = 13 minimum average, tested by the LTTR method in accordance with CAN/ULC S770.
- B. Tapered Insulation: Factory tapered polyisocyanurate at crickets and where required for slope.

2.04 INSULATION FASTENERS

- A. Insulation Fasteners and Distribution Plates: Furnished by the manufacturer of the roof system. Compliant with FM #4470 corrosion resistance requirements and approved as a component meeting design and wind uplift criteria.

2.03 RELATED MATERIALS

- A. Nails and Mechanical Fasteners: Types and lengths recommended by system manufacturer.
- B. Cants: Asphalt impregnated preformed perlite, 45 degree slope. Nominal 4" high.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. General: Verify that work of other trades which penetrates roof membrane has been completed. Examine surfaces for inadequate anchorage, drainage, foreign material, moisture and unevenness which would prevent the execution and quality of application of roofing system as specified. Report unsatisfactory conditions to the Contractor.
- B. Acceptance: Do not proceed until the surface to be covered is acceptable. Beginning of work means acceptance of substrate.

3.02 PREPARATION

- A. Protection: Protect paving and building walls adjacent to hoist prior to starting work with protective covering. Lap suitable protective covering materials at least 6". Secure protective coverings against wind. Leave protective covering in place for duration of roofing work.
- B. Surface Preparation; Dry and broom clean before beginning work. Roof drains that are not at the proper level to drain the finished roof shall be reset at the proper elevation before proceeding with roofing installation.

3.03 INSULATION SYSTEM

- C. Insulation: Mechanically fasten base layer of insulation with vertical joints staggered in accordance with insulation manufacturer's recommendations and approved shop drawings as required to meet design wind uplift requirements.
 - 1. Install second layer of insulation adhered in hot asphalt with vertical joints staggered in accordance with insulation manufacturer's recommendations and approved shop drawings as required to meet design wind uplift requirements.
 - 2. Install tapered insulation where indicated or required to form slopes, crickets or cants. Adhere to base insulation with a mopping of hot asphalt.
 - 3. Install all insulation with 1/4" maximum joints.
 - 4. Install cover board over insulation with mopping of hot asphalt. Stagger joints and butt tight.

3.04 ROOFING SYSTEM APPLICATION

- A. General: Install roofing system in accordance with manufacturer's recommendations and approved shop drawings.
- B. Base Sheet: Set in full mopping of asphalt with 3" side and 4" end laps. Stagger end laps minimum of 3" apart.
- C. Cap Sheet: Set in full mopping of asphalt with 3" side laps and 4" end laps. Stagger and laps minimum of 3" apart.
- D. Flashings: Apply, lap and splice using methods, materials and details recommended by manufacturer.
- E. Parapet Flashing: Provide flashing in rolls of lengths required for minimum number of field seams. Seal seams with asphalt in accordance with manufacturer's instructions.
- F. Terminations: Make terminations according to manufacturer's standard details.

3.05 FIELD QUALITY CONTROL

- A. The roofing manufacturer's regional representative shall inspect the work a minimum of two (2) times during installation of the roof and submit inspection report to Contractor, who will submit copies to Architect.
- B. Manufacturer's Field Service: A representative of the roofing manufacturer shall make an inspection upon completion to ascertain that the entire system has been installed according to manufacturer's specifications and details.

3.06 CLEANING

Upon completion, remove surplus materials and debris from the site. Remove and clean drippage or spills of asphalt from adjacent finish surfaces.

END OF SECTION

SECTION 07 62 00 FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Flashing and Counterflashing
 - 2. Gutters and Downspouts
 - 3. Other sheet metal flashing related to the above, shown on the drawings and not specified elsewhere

- B. Related Sections:
 - 1. Rough Carpentry: Section 06 10 00
 - 2. Painting: Section 09 91 00
 - 3. Mechanical: Division 23

1.02 REFERENCES

Galvanized and Prefinished Sheet Metal Installation: Comply with recommendations of "Architectural Sheet Metal Manual", Fifth Edition, as published by Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).

1.03 SUBMITTALS

- A. General: Submittals shall be in accordance with Sections 01 33 00 and 01 33 23.

- B. Shop Drawings: Submit complete fabrication shop drawings.

- C. Product Data: Submit catalog data for prefinished sheet metal.

- D. Warranty: At completion of project, submit warranties specified under Article 1.05.

- E. Samples: Submit actual color samples of prefinished metal for Architect's selection.

1.04 QUALITY ASSURANCE

Contractor Qualifications: Sheet metal shall be manufactured and installed only by a firm experienced in sheet metal work and which has been in the sheet metal business continuously for the past five (5) years.

1.05 WARRANTY

- A. Prefinished Metal Finish: Provide manufacturer's twenty (20) year warranty that finish will not crack, peel, chalk, or fade in accordance with Section 01 77 00.

- B. Sheet Metal: Sheet metal work shall be warranted, in writing, against defects in materials and workmanship for a period of two (2) years in accordance with Section 01 77 00.

PART 2 - PRODUCTS

2.01 SHEET METAL

- A. Prefinished Metal: 24 gauge prefinished galvalume metal sheet conforming to ASTM A792 with Kynar fluoropolymer finish. Up to one (1) color from manufacturer's standard and premium (non-metallic) color range may be selected by Architect. As manufactured by one of the following acceptable manufacturers:
 - 1. Englert
 - 2. MBCI

3. AEP Span
4. US Metals, Inc.
5. Approved Substitute

2.02 ACCESSORY MATERIALS

- A. Nails and Fasteners: Galvanized or cement coated for galvanized iron; prefinished metal to match sheet metal for prefinished metal; size and type as required.
- B. Self-Adhered Underlayment (Ice and Water Damming Shield): Self-adhered rubberized asphalt waterproofing membrane, minimum of 40 mils thick, Class A rated, complying with ASTM D1970, as manufactured by Owens-Corning, W. R. Grace, or Protecto-Wrap.
- C. Sealant: As specified in Section 07 92 00. Roofers mastic is not acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Examine surfaces to receive sheet metal and do not begin work until unsatisfactory conditions are corrected. Surfaces shall be smooth, sound, clean and dry, and fabric flashing shall be in place before work is started.

3.02 PREPARATION

- A. Protective Coating: Coat contacting dissimilar metals with asphaltic compound.
- B. Field Measurements: Before fabricating sheet metal, verify shapes and dimensions of surfaces to be covered.

3.03 WORKMANSHIP

Unless indicated otherwise on the drawings, workmanship and details shall comply with reference standards listed under Article 1.02. Construct joints watertight and allow for expansion.

3.04 Not Used.

3.05 STRUCTURAL PENETRATIONS

Construct Umbrella Flashing of galvanized sheet metal as detailed and per SMACNA, Page 4.32, Figure 4-16 A/B, at all membrane roof penetrations by structural elements or equipment supports.

3.06 Not Used.

3.07 PIPE, VENT, AND CONDUIT PENETRATIONS

All pipe, vent, and conduit penetrations shall be contained in a prefabricated pipe curb assembly unless otherwise noted.

3.08 COUNTER FLASHING

Provide receiver and insert flashing where indicated. Construct two piece system of galvanized iron or prefinished metal designed and installed to spring tight against base flashing. Unless otherwise indicated, construct according to SMACNA, Page 4.6, Figure 4-3C. Construct from prefinished metal where exposed to view.

3.09 Not Used.

3.10 GUTTERS AND DOWNSPOUTS

Construct gutters downspouts of prefinished metal. Downspouts shall be open type secured to wall with straps punched to hold downspout clear of wall. Unless otherwise indicated, construct gutters to style U.

3.11 UMBRELLA FLASHING

Construct umbrella flashing of galvanized sheet metal as detailed and per SMACNA, Page 4.32, Figure 4-16 A/B, at all guardrail and mechanical screen roof penetrations.

END OF SECTION

Not for Construction

SECTION 07 72 00 ROOF ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Prefinished Static Roof Vents

- B. Related Sections:
 - 1. Fiberglass Shingles: Section 07 31 13
 - 2. Flashing and Sheet Metal: Section 07 62 00
 - 3. Painting: Section 09 91 00

1.02 SUBMITTALS

Provide shop drawings and product data on roof accessories in accordance with Sections 01 33 00 and 01 33 23.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

Store roof accessories off the ground and under cover.

PART 2 - PRODUCTS

2.01 PREFINISHED METAL STATIC ROOF VENTS

- A. Acceptable Manufacturers:
 - 1. Master Flow Model # R50ABL
 - 2. or approved substitute

- B. Roof Vent: 50 sq. in. net free area per vent. Heavy duty aluminum construction. Black finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Per Manufacturers recommendations.

END OF SECTION

SECTION 07 92 00 JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Provide sealant shown on the drawings, specified herein, and where specified under other sections. Where referenced as "caulk" or "caulking", the material shall be joint sealant as specified in this Section.
- B. In general, seal openings shown on the drawings and at other locations requiring joint sealant to seal visually and against infiltration from air and water, including, but not limited to, the following:
1. Masonry control joints
 2. Isolation joints, between structure and other elements
 3. Joints at penetrations through walls, decks, and floors by piping, and other service and equipment
 4. Joints between items of equipment and other construction
 5. Joints inside and outside between exterior door and window frames and adjacent materials
 6. Bedding for exterior door thresholds
 7. Open joints between dissimilar materials as required to close and conceal jointing of the work
 8. Construction joints between dissimilar materials; joints around door frames, and other penetrations and openings in the exterior wall; interior walls as detailed or specified
 9. Sawed or formed recesses at control joints and expansion joints in interior floor slabs not receiving floor covering
 10. Expansion joints in sidewalks and exterior slabs on grade
 11. Space between base cabinets backsplash and wall
 12. Joints in fire-resistive construction:
 - a. Corridor walls, floors and ceilings.
 - b. Other locations as required or indicated on the drawings.
 13. Other joints as detailed

1.02 FIRE RATED SYSTEM REQUIREMENTS

Joint sealant assemblies in fire-resistive construction shall be listed or classified for fire (F) and temperature (T) rating required by independent testing agency such as Underwriters Laboratories, Inc. (UL) or other agency acceptable to local building authority. Typical rating for fire-resistive construction is 1-hour unless otherwise indicated on the drawings.

1.03 SUBMITTALS

- A. Product Data: Submit product data of each material intended for use. Indicate location of application. Submit UL listing data for joint sealant assemblies in fire-resistive construction.
- B. Color Samples: Submit color chart for each type of sealant in accordance with Sections 01 33 00 and 01 33 23.
- C. Contract Closeout Submittals: Submit warranty specified under Article 1.07.

1.04 QUALITY ASSURANCE

- A. Applicator Qualifications: Application by qualified sealant contractor in business for at least five (5) years prior to this installation, employing skilled tradesmen for the work.

- B. **Manufacturer's Technical Representative:** Obtain materials from manufacturers who will, if required, send a qualified technical representative to project site, for the purpose of advising the installer of proper procedures and precautions for the use of the materials.

1.05 **DELIVERY, STORAGE AND HANDLING**

Deliver in original, unopened containers and store in an area not subject to extreme heat or cold.

1.06 **JOB CONDITIONS**

Environmental Requirements: Do not apply exterior sealants during wet weather or when the outside temperature is below 40 degrees F. Do not apply interior sealants when the inside temperature is below 60 degrees F.

1.07 **WARRANTY**

Furnish a two (2) year warranty in writing to replace joint sealant that fails during the warranty period at no cost to the Owner. Submit two (2) copies of written warranty agreeing to repair or replace sealants which fail to perform as air-tight and watertight joints; or which fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or which appear to deteriorate in any other manner not clearly specified as an inherent quality of the material by submitted manufacturer's data.

PART 2 - PRODUCTS

2.01 **NON-RATED JOINT BACKING MATERIAL**

- A. **Non-Fire Rated:** Size joint backing material for minimum 30% compression when inserted in the joint. Material shall be round rod or semi-circular type.
- B. **Acceptable Manufacturers and Type:**
 1. Dow Chemical Company, Ethafoam
 2. BASF (Sonneborn), Sonofoam
 3. Backer Rod Manufacturing, Inc., Denver Foam
 4. or approved substitute

2.03 **JOINT SEALANTS**

- A. **Acceptable Manufacturers:**
 1. DAP Incorporated
 2. Parr, Inc.
 3. Pecora Corporation
 4. BASF (Sonneborn Building Products)
 5. Tremco Manufacturing Company
 6. W. R. Grace and Company
 7. Mameco International
 8. Sika Corporation
 9. Bostick
 10. Dow Corning
 11. or approved substitute
- B. **Acceptable Materials:**
 1. **Primer:** As recommended by the sealant manufacturer.
 2. **Interior Sealants:** Latex acrylic.
 3. **Interior Fire-Rated Joint Sealant:** One or two-component acrylic, silicone, or polyurethane having UL listing. Joint sealants for walls and ceilings shall be paintable.

4. Control Joints and Expansion Joints in Interior Floor Slabs, Exterior Sidewalks, and Slabs on Grade: Two component pourable self-leveling polyurethane.
5. Perimeter caulking joints at door and window frames: Medium-modulus, high-recovery, one-component, neutral-cure 100% silicone.
6. All Remaining Joint Sealants: Two-component polyurethane, Type II, Class A, nonsag.

2.04 BOND BREAKER TAPE

Polyethylene tape or other plastic tape as recommended by the sealant manufacturer to be applied to sealant-contact surfaces where bond to the substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape wherever applicable.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Applicator shall be responsible for inspecting work prior to application of work under this Section. If joint or space to receive work is not according to detail and cannot be put into proper condition to receive the work by specified methods, notify the Contractor in writing, or assume responsibility for and correct any unsatisfactory caulking and sealing resulting.

3.02 PREPARATION

- A. Preparation of Surfaces: Clean surfaces in accordance with joint sealant manufacturer's recommendations. Remove dirt, incompatible coatings, moisture, and other substances that would interfere with bond of sealant. Mask edges, if required, to protect adjoining surfaces and produce a straight finish line.
- B. Do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating. Remove coating or treatment joint surfaces before installing sealant.
- C. Etch concrete masonry joint surfaces to remove excess alkalinity unless sealant manufacturer's printed instruction indicates that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid, neutralize with diluted ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.
- D. Priming: If required, prime surfaces that are to be sealed with manufacturer's recommended or standard primer, after the surfaces have been prepared as specified. Before use, check primers for discoloration and dirt pick-up on adjacent surfaces. If staining occurs, after exposure, take adequate measures to prevent the primer from being applied over the face of adjacent porous materials by masking or other suitable measures.
- E. Joint Backing: Joints which are to be sealed shall be of depth necessary to provide for the specified allowable thickness of sealant and the required backing where indicated and required by sealant manufacturer for fire-rated joint assemblies. Backing shall be type as specified and recognized for the allowable depth of the sealant. Size and shape of the backing shall be as required by the width of the joint and/or specified.
- F. Compress non-rated joint backing material a minimum of 30% when inserted in the joint. Backing material for the upper portion of joints shall be a round rod or semi-circular in cross-section with the arc in contact with the sealant. Insert fire-rated joint backing material in accordance with UL listed system description.
- G. Install bond breaker tape wherever required by joint sealant manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

3.03 APPLICATION

- A. Exterior Metal Sills: Set in full bed of polyurethane sealant.
- B. Thresholds: Set in full bed of polyurethane sealant, refer to Section 08 71 00.
- C. Sealant Joints: Apply sealants in continuous beads without open joints, voids, or air pockets, using a ratchet hand gun or mechanical powered gun. Confine sealants to joint areas with masking tapes or other precautions. Apply compounds in concealed compression joints accurately so that excess compound will not extrude from joints. Remove excess compound or sealant promptly as work progresses, and clean adjoining surfaces.
- D. In rough surfaces or joints of uneven widths, install sealant well back into joint. Recess equal to width of joint, or 3/8" minimum at non-rated joints in masonry. Use anti-tack agent where necessary to protect freshly-applied sealant from public traffic and dirt.
- E. Joints shall be slightly recessed as to facilitate a painter's line. Joints throughout construction shall be hand tooled and finished. Work shall be done according to joint sealant manufacturer's printed instructions and specifications.
- F. Interior Floor Slabs: Apply sealant at joints between interior floor slab and exterior wall and foundation. Apply sealant at sawed or formed recesses at control joints and expansion joints in interior floor slabs not receiving floor covering. Pour joints full but do not over fill.
- G. Expansion Joints in Sidewalks and Exterior Slabs on Grade: Seal joints between exterior concrete and building and at formed expansion joints. Pour joints full but do not over fill.
- H. Joints at Penetrations Through Walls, Decks, and Floors: Apply bead of sealant around piping, conduit, sleeving, and other penetrations through walls and floors. Install backing material as required to fully pack opening around penetration and apply sealant to specified thickness. Completely seal all joints of any penetration through sound isolation walls. Include perimeter joints and elements penetrating only one face of the sound wall.
- I. Workmanship: Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of the joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- J. Joint Sizes: Install sealants to depths as recommended by the sealant manufacturer and within the following general limitations:
 - 1. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but not more than 1/2" deep or less than 1/4" deep.
 - 2. For fire-rated joints, fill joints to a depth of 1/2" or as recommended by manufacturer of UL listed sealant material.
- K. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or the sealant/caulking compound.
- L. Remove excess and spillage of compounds promptly as the work progresses. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage. Do not damage the adjoining surfaces or finishes.

3.04 FIELD QUALITY CONTROL

Tests: Where directed by the Architect, cut out and remove a total of three samples consisting of the undisturbed sealant and back-up material from the joint. Samples shall be 6" in length. Reseal cut-out areas with the same materials.

3.05 CURING, PROTECTING AND CLEANING

- A. Cure sealants in compliance with joint sealant manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength, and surface durability.
- B. The applicator shall advise the Contractor of procedures required for the protection of sealants and caulking compounds during the construction period, so sealants shall be without deterioration or damage (other than normal weathering) at the time of the acceptance.
- C. Protect surfaces from damage. Clean soiled surfaces immediately. Replace with new material any damaged material that cannot be cleaned.

END OF SECTION

DIVISION 8 DOOR AND WINDOWS
SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes Items Shown on the Drawings and as Specified Including, But Not Limited to, the Following:
1. Prime Coated Steel Doors and Frames
 2. Prime Coated Sidelights and Borrowed Lights and Transom Panels
- B. Related Sections:
1. Metal Fabrications: Section 05 50 00
 2. Joint Sealants: Section 07 92 00
 3. Prefinished Wood Doors: Section 08 14 29
 4. Access Doors: Section 08 31 130
 5. Door Hardware: Section 08 71 00
 6. Glazing: Section 08 81 00
 7. Painting: Section 09 91 00

1.02 REFERENCE STANDARDS

- A. Steel Doors and Frames Must Meet Standards as Established by the Following References:
1. Door and Hardware Preparation ANSI 115
 2. Life Safety Codes NFPA-1 (Latest Edition)
 3. Fire Doors and Windows NFPA-80 (Latest Edition)
 4. Steel Door Institute ANSI/SDI-100 (Latest Edition)
 5. Steel Door Institute SDI-117 "Manufacturing tolerances standard Steel Doors and Frames"
- B. Comply with ASTM Standards referenced within the text of this specification.

1.03 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for items under this section in accordance with Sections 01 33 00 and 01 33 23. Include complete details of each door and frame type, door and frame elevations, installation requirements, door hardware preparation and reinforcement requirements, anchorage, and all accessory items.
- B. Product Data: Submit complete product data for each type of door and frame specified. Include all detail relating to construction, materials, core, and label compliance.
- C. Templates: Hardware templates for hardware mounted on hollow metal work shall be submitted by the hardware supplier directly to the hollow metal manufacturer immediately after approval of the hardware schedule. Failure to receive templates with reasonable promptness shall be reported to the Contractor.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings. Indicate coordination of glazing frames and stops with glass requirements.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Provide UL label or other label acceptable to local building official on doors and frames indicated in the door schedule or on elevations to be fire rated.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Doors and Frames: Doors and frames shall be properly marked with door opening mark to correspond with Door Schedule.
- B. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- C. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- D. Storage and Protection: Store doors and frames on edge, undercover protected from elements.
 - 1. Store frames in such a position as to prevent twisting.
 - 2. Place units on 4" high wood blocking.
 - 3. Avoid using nonvented plastic or canvas shelters that could contain humidity. If cardboard door wrappers become wet, remove immediately.
 - 4. Provide minimum 1/4" spaces between doors to promote air circulation.

1.06 JOB CONDITIONS

Installer must examine the conditions under which steel doors and frames will be installed and notify the Contractor in writing of any condition detrimental to the proper and timely completion of the work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Acceptable Manufacturers:

- 1. Amweld Building Products, Inc.
- 2. Gateway Metal Products
- 3. Curries Company
- 4. Pioneer Industries, Inc.
- 5. North Central Supply, Inc.
- 6. CECO Door Products
- 7. Elco Manufacturing, Inc.
- 8. Rocky Mountain Metals, Inc.
- 9. Southwestern Hollow Metal
- 10. Steelcraft Manufacturing Co.
- 11. or approved substitute

2.02 HOLLOW METAL MATERIALS

- A. Materials utilized for hollow metal doors and frames to be painted shall be commercial quality, level, cold-rolled steel conforming to ASTM A366 or hot-rolled, pickled, and oiled steel conforming to ASTM A569. Materials shall be free of scale, pitting, or surface defects. Gauge of steel as indicated in following articles.
- B. Exterior doors and frames shall receive galvanized hot-dip coating conforming to ASTM A924, and ASTM A653 (A60) with total coating weight not less than 0.60 ounces per square foot, total both sides. Galvanized steel shall be treated to insure proper paint adhesion. All

components and parts used in galvanized doors or frames shall be coated in conformance to the galvanizing specification requirements.

2.03 HOLLOW METAL FRAMES

- A. Frames for hollow metal and wood doors, borrowed lights and steel window walls, etc., indicated on the schedule or drawings to be steel shall be of design sections as detailed and assembled as specified below. Frames shall be pre-assembled in factory to the greatest extent possible allowing for shipping limitations.
- B. Frames in exterior walls shall be 14 gauge steel. Provide internal reinforcing as required to comply with wind load requirements and Article 1.02.
- C. Frames in interior walls shall be 16 gauge steel, unless otherwise noted.
 - 1. Frames with door openings over 48" wide shall be fabricated from 14 gauge steel.
- D. Construction:
 - 1. Construct frames encompassing one or more doors with sidelights or transoms, and steel window walls, etc., in rigid units of a large size as practical to reduce to a minimum the number of joints. Corners shall be mitered and continuously welded. All horizontal and vertical intersections, corners, joints, and connections which are exposed to weather shall be fully (continuously) welded, ground and finished smooth for the entire length of weather-exposed joint. Face only welds are only acceptable at interior conditions. The entire assembly shall be reinforced and braced as required to ensure absolute rigidity. Provide channel stiffening within and securely welded to frame member.
 - 2. Provide thermal expansion joints as indicated or as required for specific assemblies.
- E. Joints and intersections exposed to weather shall be watertight. Caulk or fillers will not be accepted. Conceal welded joints in two-sided mullions or similar sections behind glazing stops.
- F. Machine frames for attachment of hardware, including mortising, reinforcing, drilling and tapping for hinges. Top hinge shall have 7 gauge, full throat reinforcement.
- G. Furnish anchors of type and number required for anchoring frames to structure, partitions, etc., as follows (wire anchors will not be allowed):
 - 1. 3 jamb anchors, plus one floor anchor, on jambs up to and including 7'-0" high
 - 2. 4 jamb anchors, plus one floor anchor, on jambs over 7'-0"
 - 3. 1 floor anchor on each jamb at metal stud partitions
- H. Install mortar protection box behind each opening in frame where frame is set in masonry.
- I. Provide such installation instructions as are necessary to ensure proper installation of anchors.
- J. Drill stop of lock jamb of each interior frame for installation of rubber door silencers where required under Section 08 71 00.
- K. Provide door and window frames in the design and configuration illustrated and which achieve the required fire-ratings. Hollow metal window frames in one-hour fire resistive construction shall be a forty-five (45) minute fire rated assembly.
- L. Provide removable metal glazing stops, screwed to frame, at borrowed lights and window walls as described in Article 2.05. Unless otherwise indicated, glazing stops shall be located on the occupied (room) side of interior frames and on the outside of exterior frames. See Section 08 81 00 for glazing clearance requirements.

- N. Reinforce frames to receive surface mounted hardware. Provide top hinge, 7 gauge full width reinforcement, for doors up to 36" in width. Add middle and bottom hinge reinforcement for doors over 36" wide. Provide high frequency hinge reinforcement at interior and exterior vestibule door frames.

2.04 HOLLOW METAL DOORS

- A. Doors indicated on the schedule as hollow metal shall be flush hollow metal, swing type doors of the types shown and described below.
 - 1. Exterior Doors constructed of 14 gauge steel.
 - 2. Interior Doors constructed of 16 gauge steel.
- B. Hollow metal doors shall be fully welded and ground smooth. Vertical seams shall be fully welded, lock seams or epoxy filled seams are not acceptable. Top and bottom edges shall be as follows:
 - 1. Exterior hollow metal doors and panels - top: Shall be manufactured with flush filler 14 gauge top welded in place; plastic inserts are not acceptable.
 - 2. Exterior hollow metal doors and panels - bottom: Shall be manufactured with standard inverted 14 gauge bottom channel welded in place.
 - 3. Interior hollow metal doors and panels - top and bottom: Shall be manufactured with standard inverted 14 gauge top and bottom channel welded in place.
- C. Provide foamed thermal insulation in all exterior doors. Honeycomb core is not acceptable, provide manufacturer's standard steel stiffeners.
- D. Doors to be mortised and reinforced to receive hardware. Special attention shall be given to reinforcing the doors where hardware is to be bolted through the door. Hinge reinforcement shall be 7 gauge, lock reinforcements 16 gauge minimum, closer reinforcement box 14 gauge x 20" long minimum. Hinge and lock reinforcements shall be projection welded to the door edge. Galvanized doors shall have galvanized door reinforcements. Provide reinforcement for other hardware as required. Provide high frequency hinge reinforcement at interior and exterior vestibule doors.
- E. Provide manufacturer's standard flush type glass molding with removable stop at doors with glazing panels. Fixed molding shall be welded to door, removable stop shall be tightly fitted with butt joints secured with screws.
- F. Provide fire rated construction, core, and labels on doors indicated in schedule to be fire rated.
- G. Provide 20 gauge, hat shaped, vertical concealed stiffeners inside all hollow metal doors. Stiffeners shall be located at 6" O.C. and welded to the face sheet at 4" O.C.
- H. Clearances to frame shall be not more than 1/8" at head and jambs, except between pairs of non-rated doors which shall be no more than 1/4". Doors bottoms shall be undercut no more than 3/4". For fire rated doors provide clearances per NFPA 80.
- I. Fire rated doors will require "Positive Pressure", "S" labeling for 2006 IBC compliance. Provide doors that have been tested and approved for positive pressure labeling. Special sealing systems, if required for "S" labeling, to be supplied by door supplier.

2.05 GLAZING STOPS

- A. Glazing stops for hollow metal frames shall be 5/8" x 5/8" or 3/4" x 3/4" 20 gauge, cold-rolled channel, shaped as required or detailed and hand fitted to each opening. Removable stop

shall be tightly fitted with butt joints secured with screws, 1'-6" on center, oval head, countersunk; provide zinc-plated screws at exterior frames.

2.06 MISCELLANEOUS ITEMS

- A. Provide closures, sub-sills, transom panels, fillers, etc., indicated on drawings. Gauges, materials, and construction shall match door and frame.
- B. Provide welded, blade-type steel door louvers in door panels and transoms as indicated on drawings. Louvers for exterior application shall have steel framed 1/4" galvanized hardware cloth screen secured to back of louver.

2.07 HOLLOW METAL FINISH

- A. Thoroughly clean hollow metal surfaces to be painted of grease, rust and scale. Chemically treat surfaces to ensure paint adherence. Apply filler to doors and frames where required to produce a smooth surface prior to application of primer. Apply one coat of manufacturer's standard rust-inhibitive primer. Allow primer to fully cure prior to shipment.
- B. Exterior hollow metal doors and frames (galvannealed, refer to Article 2.02, Paragraph B) shall be shipped un-primed for high performance field primer and finish. Clean exposed welded joints and field prime with high performance primer immediately upon receiving shipment on site.
 - 1. Prime exterior hollow metal doors and frames with Tnemec Series 37-H (alkyd) or 161-1255 (epoxy), minimum 4.0 mil dry film thickness. (Refer to Section 09 91 00 for other acceptable manufacturers.)

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Frames:
 - 1. Set steel frames accurately in accordance with details, straight and free of twist with head level and jambs plumb. Rigidly anchor to walls and partitions and securely brace until surrounding work is completed. Provide deflection clearances at frame heads where indicated.
 - 2. Wherever possible leave spreader bars in place until frames are securely anchored.
 - 3. Fill jambs with grout in accordance with Section 04 20 00 wherever frames occur in masonry walls. At exterior grout filled frames with continuous hinge or closer, field apply 1/2" thick strip of extruded polystyrene foam board inside frame, continuous behind jamb face for length of mounting of continuous hinge or closer. Foam board shall displace grout inside frame to allow for full mounting screw penetration.
 - 4. Weld all field joints and intersections at jobsite as described in Article 2.03.
- B. Doors: Apply hardware in conformance with hardware manufacturer's templates and instructions. Hang doors to be free of binding with all hardware functioning properly.
- C. Miscellaneous Items: Install closures, transom panels, fillers, etc., as indicated.
- D. Sand smooth and repair any rusted or damaged paint prime coat areas. Apply compatible air drying paint primer to affected area.

3.02 ADJUSTING

At completion of job, adjust doors and hardware as required and leave in proper operating condition. Any door that warps, twists, or otherwise binds in the hollow metal frame during the warranty period shall be removed and replaced with a new door properly prepared to accept the specified hardware and completely finished to match the original door.

3.03 JOB FINISH

Paint hollow metal doors, frames, and glazing stops in accordance with Section 09 91 00. Particular attention shall be given exposed welds on exterior doors and frames (galvannealed) when received on site. Exposed welds shall immediately be cleaned of rust and field primed with high performance primer. Use when galvannealed exterior H.M. is shipped unprimed, see Article 2.07.

END OF SECTION

Not for Construction

SECTION 08 14 29 PREFINISHED WOOD DOORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Factory Finished Non-Rated and Fire-Rated Wood Doors
 - 2. Factory Glazed Vision Lights in Doors

- B. Related Sections:
 - 1. Finish Carpentry: Section 06 20 00
 - 2. Glazing: Section 08 81 00
 - 3. Hardware: Section 08 71 00
 - 4. Steel Doors and Frames: Section 08 11 13

1.02 REFERENCES

- A. Architectural Woodwork Quality Standards, latest Edition, as published by the Architectural Woodwork Institute (AWI) and Woodwork Institute (WI).

- B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1A (latest edition) standard for "Architectural Wood Flush Doors".

1.03 SUBMITTALS

- A. Shop Drawings: Submit shop drawings and product data for wood doors in accordance with Sections 01 33 00 and 01 33 23. Include indication of fire resistive and positive pressure compliance for rated openings.

- B. Quality Control Submittals: Hardware templates for hardware mounted on wood doors shall be submitted by the hardware supplier directly to the wood door manufacturer immediately after approval of the hardware schedule. Failure to receive templates with reasonable promptness shall be reported to the Contractor. Wood doors shall be pre-fit and pre-machined for hardware.

- C. Samples: Submit actual samples of available colors of factory finished wood doors for selection by Architect.

- D. Contract Closeout Submittals: Submit door warranty as specified in Article 1.06.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Fire rated doors and panels shall meet the requirements of ASTM E152.
 - 1. Provide UL label or other certifying label of independent testing agency acceptable to local building official on doors indicated in the door schedule to be fire rated. As required by 2006 International Building Code, label must certify Positive Pressure testing and compliance.
 - 2. All glazing stops shall be labeled by Underwriters' Laboratories, Inc., as required by the door assembly rating.
 - 3. National Fire Protection Association (NFPA) 80 standard for fire doors.

- B. Reference Standards:
 - 1. Wood doors shall comply with AWI / WI Architectural Woodwork Standards (latest edition) Section 9, Custom Grade.
 - a. Performance Grade: Extra Heavy Duty

2. Factory finish of wood doors shall comply with AWI / WI Architectural Woodwork Standards (latest edition) Section 5, Custom Grade.

- C. Obtain flush wood doors through one source from a single manufacturer.
- D. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain added urea formaldehyde.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
 - 1. Doors shall be delivered in manufacturer's standard packaging. Inspect for damage upon receipt.
 - 2. Comply with manufacturers requirements for delivery, storage, and handling of doors.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.
- C. Delivery: Do not deliver doors until building is entirely enclosed and humidity in the building has reached average relative humidity to the locality.
- D. Storage: Stack doors flat and off the floor. Do not drag doors across one another.

1.06 WARRANTY

- A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Prefinished wood doors shall be warranted for the life of the installation to include reasonable cost of rehanging. Doors that are replaced during the one (1) year warranty period shall be rehung by the Contractor. After the building warranty has expired, replacement doors shall be furnished and installed by the door manufacturer. Submit warranty on door manufacturer's standard form signed by the Manufacturer, Installer and Contractor.
- C. Doors shall be repaired or replaced which have warped (bow, cup, or twist) more than 1/4" in a 42" x 84" section or that show telegraphing of core construction in the face veneers exceeding 0.01" in a 3" span or do not comply with tolerances in referenced quality standard.

PART 2 - PRODUCTS

2.01 DOOR MANUFACTURERS

Acceptable Manufacturers:

- 1. Algoma Hardwoods, Inc.
- 2. Marshfield Door Systems, Inc.
- 3. Eggers Industries
- 4. V.T. Industries, Inc.
- 5. Oshkosh Architectural Door Co,
- 6. or approved substitute

2.02 NON-RATED SOLID CORE WOOD DOORS

- A. Manufacturer and Type:
 - 1. Marshfield DPC-1 with Particle Board Core
 - 2. or equivalent of other acceptable manufacturer

- C. General: Non-rated wood doors shall be 1-3/4" thick, solid core construction with rails and stiles bonded to the core.
1. Width and height as indicated in the Door Schedule.
 2. Doors shall be 5 ply construction conforming to AWI Section 1300 with cross banding and solid particleboard core (PC-5 ME).
 3. Manufacture doors with 3/4" undercut to preserve full bottom rail.
 4. Doors shall be factory pre-machined for hardware including drilled pilot holes for screws.
 5. Provide 5" wood top rail blocking at doors indicated to have closers.
 6. Provide 5" wood bottom rail blocking at doors indicated to have kick, mop or armor plates
 7. Provide 5" wood mid rail blocking at doors indicated to have exit devices.
- D. Veneers and Edge Strips: Doors shall have custom grade, book-matched face veneers of plain sliced Grade A Red Oak with running match assembly both sides.
1. Provide 1-3/8" matching vertical hardwood edges.
 2. Veneer to be laminated to core in a hot-press method after core (with bonded rails and stiles) has been planed as a unit.
 - a. Submit one 8" x 10" sample of veneer-on-substrate illustrating expected range of component finish color and/or grain.
- E. General: Provide solid blocking or wide rails at all surface applied hardware, regardless of type of core required.
- 2.03 FIRE-RATED SOLID CORE WOOD DOORS AND TRANSOM PANELS
- A. Twenty Minute Fire-Rated: Label is required, with certification of Positive Pressure testing.
1. Marshfield DSP-20PP
 2. or equivalent of other acceptable manufacturer
- B. General: Fire-rated wood doors and transom panels shall comply with all requirements of Article 2.02, Paragraphs B and C, except provide solid core of particle board (PC-5 ME) or non-combustible mineral composite core (FD-5 ME) depending upon fire-rating required. Provide mineral core complying with ASTM E152 for rated doors of 3/4 hour or more. Provide solid blocking or wide rails at all surface applied hardware, regardless of type of core required.
- C. Fire rated doors will require "Positive Pressure", "S" labeling for 2006 IBC compliance. Provide doors that have been tested and approved for positive pressure labeling. Special sealing systems, if required for "S" labeling, to be supplied by door supplier.
- 2.04 VISION LIGHT GLAZING FRAMES
- A. Non-rated Glazing Frames: Marshfield Type W-6 prefinished low-profile (3/8" high) flush style wood frames to match door veneer and color, or equivalent of other acceptable manufacturer. See Door Elevation drawings for sizes.
- B. Twenty (20) Minute Fire-rated Glazing Frames: Marshfield Type W-6 prefinished low-profile (3/8" high) flush style wood frame to match door veneer and color with concealed metal stop, or equivalent of other acceptable manufacturer. See Door Elevation drawings for sizes.
- 2.05 FACTORY GLAZING
- Glass vision lights and glazing frames shall be factory glazed by the door manufacturer. See Door Elevation drawings for sizes and types of glazing required. Vision lights shall be complete with glazing compound and / or caulking as required for fire-rating.

2.06 FACTORY FINISH

- A. Wood doors shall receive factory finish of water base stain and ultraviolet (UV) cured polyurethane sealer.
 - 1. Finish shall meet or exceed performance standards of AWI / WI Architectural Woodwork Standards (latest edition) System 11 - catalyzed polyurethane finish system, custom grade. System shall include initial wash coat of reduced sealer, transparent stain (color as selected by Architect), vinyl sealer, sanding, and topcoat (satin gloss).

PART 3 - EXECUTION

3.01 EXAMINATION

Before installation, verify that frames are proper size and type for the door and are installed as required for proper installation of doors.

3.02 INSTALLATION

- A. Installation shall be by skilled finish carpenters or factory authorized installers in accordance with AWI Quality Standards and NFPA 80 Standards.
 - 1. Tolerances shall comply with the requirements of NFP 80 and AWI / WI Architectural Woodwork Standards (latest edition) Section 9.
 - 2. Installation of factory finished wood doors shall not occur until just prior to substantial completion to avoid damage to door panels by adjacent construction operations.
- B. Fire Rated Doors: Do not trim Positive Pressure Rated Doors for width. Exercise caution when drilling pilot holes and installing hinges. Pilot holes must not be over-drilled and screws are not to be over-torqued. Follow manufacturer's installation instructions for Positive Pressure Doors.
- C. Hang doors to be free of binding with all hardware functioning properly.
- D. Installer shall be thoroughly familiar with the door manufacturer's warranty requirements and assure compliance with all provisions.
- E. Touch up and repair factory finishes in accordance with door manufacturer's recommendations using approved materials and methods.

END OF SECTION

SECTION 08 31 13 ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Access Doors for access to mechanical valves, plumbing chases, electrical equipment, and as indicated on drawings for access to controlled spaces.

1.02 SUBMITTALS

Submit product data for access doors and floor doors in accordance with Sections 01 33 00 and 01 33 23. Provide UL label or equivalent of other accredited testing laboratory certifying that access doors which are to be installed in fire-rated construction achieves rating required.

PART 2 - PRODUCTS

2.01 ACCESS DOORS

A. Acceptable Manufacturers:

1. Milcor
2. Bilco
3. Karp
4. J.L. Industries
5. Larsen's Manufacturing Co.
6. Nystrom
7. Babcock-Davis
8. MIFAB Manufacturing, Inc.
9. Jensen Manufacturing Co.
10. or approved substitute

B. Provide non-rated or fire-rated flush face access doors to match fire-resistive rating of surface into which access door is to be installed.

C. Sizes: As indicated on drawings or as required to properly service mechanical or electrical equipment.

D. Locking Devices: Key-operated cam locks. All doors, regardless of door type, shall be keyed alike.

E. Finish: Factory primed for job finish under Section 09 91 00.

1. Finish: Factory primed for job finish under Section 09 91 00.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mechanical or Electrical Access: Access doors required by mechanical or electrical specifications under Divisions 15 and 16 and where indicated on drawings or described herein shall be provided by the Contractor and installed by the trade responsible for the material in which door is located.

B. General Access: Access doors for general access shall be provided by the Contractor and installed by trade responsible for material in which door is located.

- D. Provide 24"x24" (nominal dimension. Fit between wood ceiling framing at 24" o.c.) access door through gypsum board ceiling or bulkhead for access to attic motors and reset controls for overhead rolling fire doors (doors and counter-doors).

END OF SECTION

Not for Construction

SECTION 08 41 13 ALUMINUM STOREFRONT FRAMING, ENTRANCES AND WINDOWS

PART 1 – GENERAL

1.01 SUMMARY

- A. Provide: Aluminum Storefront (System) including but not necessarily limited to framing, entrances (doors), windows, sills, sub-sills, fasteners, clips, anchors, all other connecting devices, reinforcing, adapters, shims, glazing gaskets and accessories, trim moldings, and facing materials as shown on drawings, specified herein, or as otherwise necessary to provide a complete, weathertight and otherwise properly installed System.
- B. Products Installed But Not Furnished Under this Section:
1. Perimeter Sealing: Section 07 92 00
 2. Glass: Section 08 81 00
- C. Related Sections:
1. Final Cleaning: Section 01 74 23
 2. Concrete: Section 03 30 00
 3. Unit Masonry: Section 04 20 00
 4. Metal Fabrications: Section 05 50 00
 5. Rough Carpentry: Section 06 10 00
 6. Steel Doors and Frames: Section 08 11 13
 7. Door Hardware: Section 08 71 00
 8. Glass and Glazing other than Storefront: Section 08 81 00
 9. Electrical Devices: Division 26 (Door Contact Devices)
- D. General:
1. Architect's drawings are diagrammatic and do not purport to identify or solve problems of thermal or structural movement, glazing, anchorage, and air infiltration or moisture disposal.
 2. Requirements shown by details in the Architect's drawings establish basic dimensions of System/components, sight lines, profiles of members, and spacing and positional relationships to adjacent construction.

1.02 QUALITY ASSURANCE

- A. Provide certified independent laboratory test reports verifying compliance of System with the requirements of Paragraph 1.03,E.
- B. System and component structural tests shall conform to the "Voluntary Guide Specification for Aluminum Architectural Windows" as published by AAMA unless more stringent requirements are specified.
- C. Installer Qualifications: Installer shall be specialized in performing work of this Section and specifically experienced in the installation of work similar in scope to that required for this Project.
- D. Conduct field inspections and testing as specified in Article 3.03.
- E. General Requirements/criteria:
1. Design, engineer, fabricate and provide System, including necessary modifications to standard products to meet specified requirements and visual design concepts.
 2. Provide Manufacturer's standard weight and/or heavier than standard weight components as needed to meet specified structural design requirements.

3. Do not assume glass, sealants or interior finishes contribute to framing member strength, stiffness or lateral stability.
4. Allow for expansion and contraction without detriment to appearance or performance. Perimeter conditions shall allow for installation tolerances, expansion and contraction of adjacent materials, and sealant manufacturer's recommended joint design.
5. Assemblies shall be free from rattles, wind whistles, vibration harmonics and noise due to wind pressure or thermal or structural movement.
6. Attachment considerations are to take into account structural and expansion/contraction movements so there is no possibility of loosening, weakening or fracturing components of System or connection between System components and building structure or between System components themselves. Such movement of System or any of its components shall not be transmitted to other building elements.
7. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.
8. Any water entering System shall drain to the exterior.
9. Provide concealed fastening.
10. Metal faces shall be visually flat under all lighting conditions.
11. Provide uniform color and profile appearance at components exposed to view.

F. Structural Design Requirements:

1. Structural design shall be in compliance with the provisions of Chapter 16 of the 2015 International Building Code (IBC). Design, engineer, fabricate, and install System to withstand the applicable loads and load combinations described therein.
2. Design wind load shall be (1) based on a 3-second gust wind velocity (V_{3s}) of 100 mph, Exposure C, and a wind importance factor (I_w) value of 1.0, and (2) determined in accordance with load determining procedures prescribed in Section 6 of ASCE 7-02 or other load determining procedure permitted by IBC Section 1609, whichever results in the more severe load condition.
3. Frames located entirely within the building interior so that they are not subject to exterior wind loading shall be designed to resist a horizontal load not less than 5 psf.
4. Design, engineer, fabricate, and install System to withstand system dead load including specified glass and all System components (including any reinforcement).
5. In addition to complying with requirements of Chapter 24 of the 2009 International Building Code, deflection in the direction perpendicular to the plane of the wall, for any member, shall not exceed $1/175$ of span or $3/4$ inch, whichever is less. Deflection parallel to the plane of the wall, of members carrying full dead load, shall not exceed an amount that will reduce glass bite to less than 75 percent of the design dimension and shall not reduce edge clearance between member and panel, glass or other fixed member immediately below to less than $1/8$ inch.
6. Points of contraflexure shall not be considered to be points of lateral support of compression flanges or end points of unbraced length (L_b); unbraced length shall be actual distance between points of effective lateral support of compression flanges.
7. Where a framing member reaction is resisted by a continuous element, the maximum assumed effective length of the resisting element shall be considered to be 4 times the bearing length, but not more than 12 inches.
8. Seismic loads/performance: System, including anchorage, shall be designed to withstand the effects of earthquake motions. The System shall comply with seismic lateral displacement requirements of the 2009 International Building Code.

- G. Thermal Movement Capability/Requirements: Design, fabricate, and install System to accommodate expansion and contraction caused by the extremes of environmental conditions relevant to the locale of the installation without causing or permitting buckling, racking, warping, twisting, abrasion between System components and/or substrates or fasteners, stress on glass, glass edge-seal failure, failure of joint seals, loss of water/air infiltration resistance, excess stress

on framing members, anchors and fasteners, excessive stress on structural elements, reduction of or adverse impact on performance of System, its individual components, substrates or glass/panels, or any other detrimental effects. In no case shall extremes of environmental conditions be assumed to cause a surface temperature differential of less than 200° F on any framing member. Ensure doors function normally within limits of specified temperature differential.

1.03 SUBMITTALS

- A. Certification of compliance with Structural Design and Thermal Movement Requirements: Provide the following statement on the first sheet of each set of Shop Drawings submitted.

“THE STRUCTURAL STRENGTH (INCLUDING ATTACHMENT TO SUPPORTING BUILDING STRUCTURAL SYSTEM ELEMENTS) AND THERMAL MOVEMENT CAPACITIES OF THE ALUMINUM STOREFRONT FRAMING, ENTRANCES AND WINDOWS (SYSTEM) SHOWN ON THESE SHOP DRAWINGS HAVE BEEN ANALYZED AND FOUND TO BE SUFFICIENT TO SATISFY THE STRUCTURAL AND THERMAL MOVEMENT DESIGN REQUIREMENTS SPECIFIED IN SECTION 08410 OF THE PROJECT MANUAL FOR THIS PROJECT, INCLUDING BUT NOT LIMITED TO A DESIGN WIND LOAD BASED ON $V_{3S}=100$ MPH, EXPOSURE C, $I_W=1.0$, AND THERMAL MOVEMENT CAPABILITY BASED ON A SURFACE TEMPERATURE DIFFERENTIAL OF NOT LESS THAN 200 °F”.

Print the System manufacturer’s name directly beneath the statement and submit with the original signature of the manufacturer’s authorized technical engineering department representative directly below the manufacturer’s printed name. Print the name of the representative and the date when the statement is signed below the original signature.

- B. Shop Drawings:

1. Shop drawings shall be prepared by System manufacturer or System installer. In either case, shop drawings shall be reviewed and approved (without qualification other than comment concerning technical issues of design, fabrication or installation) by manufacturer’s technical engineering department prior to submittal to Architect. Such review and approval shall be signified by application on the shop drawings of the manufacturer representative’s dated original signature beneath the printed names of both the manufacturer and the manufacturer representative.
2. Submit shop drawings in accordance with Section 01 33 23. Prepare shop drawings (full scale where practical) describing and detailing all typical and special conditions. Provide details sufficient to thoroughly describe System. Include frame elevations, dimensions, arrangement of units and member connections, detailed design, member profiles (including any special shapes), transitions, change of direction details, joint locations, expansion mullion locations, thickness (gauges) of materials, locations of factory and field applied sealants, and provisions for expansion and contraction capability.
3. Indicate locations of various glass types and thickness and provide all glazing details. Indicate all locations of any exposed fasteners and joints for Architect’s acceptance. Show all components such as clips, anchors, fasteners, connectors, plates, reinforcing, shims, sealant types, closures, thermal breaks, and all other materials, parts, accessories and components. Identify all components and materials by manufacturer’s part numbers or other means of specific component identification. Coordinate all information in the shop drawings with the requirements and conclusions of the calculations required in paragraphs 1.03,A.
4. Identify, specifically note and explain any deviations from Contract Documents.
5. Section or detail references used on shop drawings shall be identical, or clearly cross-referenced, to such section or detail references established on the Construction Documents.

- C. Installation instructions: Submit manufacturer’s printed installation instructions/manual.

- D. Samples: Submit three (3) aluminum samples of specified finish.
 - E. Submit specified warranties (in triplicate) along with other Project Closeout documents at completion of Project.
- 1.04 WARRANTY
- A. **Notwithstanding the designation of a System or materials under Part 2-Products, the Contractor shall provide warranties for the products provided which afford the protection specified below. At the Contractor's option both installer's and manufacturer's warranties may be provided in a single document signed by both the installing contractor and the system manufacturer.**
 - B. Provide written System manufacturer's warranty in form acceptable to the Owner, executed by company official, warranting against defects in materials and products for 2 years in accordance with Section 01 77 00: Warrant door corner construction for the life of the project.
 - 1. Longitudinal and transverse thermal barrier shrinkage.
 - 2. Thermal barrier cracking.
 - 3. Structural failure of the thermal barrier material.
 - 4. Loss of adhesion or loss of prescribed edge pressure on glazing material resulting in excessive air and water infiltration.
 - C. Provide written installer's warranty in form acceptable to the Owner, executed by authorized agent of the installer, warranting work (1) to be watertight, free from defective materials and defective workmanship, and (2) against glass breakage due to defective design. Warranty shall also state that the installer agrees to replace system components which fail within 2 years from date of commencement of warranty as established in Section 01 77 00. Warranty shall cover the following:
 - 1. Complete watertight and airtight System installation within specified tolerances.
 - 2. Installation will remain free from rattles, wind whistles and noise due to thermal and wind pressure.
 - 3. System is structurally sound and free from distortion.
 - 4. Glass and glazing gaskets will not break or "pop" from frames due to wind load pressure, expansion or contraction movement, or structural loading.
 - 5. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers:
 - 1. Kawneer Company, Inc.
 - 2. Vistawall Architectural Products
 - 3. United States Aluminum Corporation
- B. Single Source Requirement: All System components specified in Paragraphs 2.01,C and D shall be obtained from a single manufacturer or from a manufacturer approved by the System manufacturer.
- C. Primary components:
 - 1. Type 1 Storefront framing (thermally broken): Outside glazed extruded ASTM B 221, 6063-T5 alloy, aluminum stick-framing system. Framing members shall have a 2" – 21/4" face dimension and a depth of 4-1/2" or shall be of such other size and configuration as may be

- dimensioned or shown on drawings. Framing members shall allow position of glazing as shown on drawings. Reinforcing members, if any are required or shown, shall be compatible with framing members.
- a. Kawneer: 451T
 - b. Vistawall: 3000T
 - c. United States Aluminum: series IT451
2. Aluminum entrances (doors): wide stile aluminum door (with stiles and rails as dimensioned on drawings). Extrusions shall be 6063-T5 alloy and temper. Door construction shall be 2" thick, minimum 3/16" wall thickness, 5" wide vertical stiles to accommodate panic hardware. Prepare door and frame sections with integral reinforcement to receive door hardware. Provide manufacturer's standard integral extruded elastomeric glazing gaskets, glazing stops, astragals, and weatherstripping.
 - a. Kawneer: Tuffline 500 (wide stile)
 - b. Vistawall: Rugged 500 WS
 - c. United States Aluminum: Durafront series 850
 3. Aluminum windows (operable vents): Project-out concealed operable vent system without sight-line build-up and complete with hardware and related components. Provide interior mounted aluminum screen in frame and 15 degree limit stops. Finish of aluminum members and components to match storefront framing.
 - a. Kawneer: 1600 Glassvent
 - b. Vistawall: ZS 2750
 - c. United States Aluminum: Series 7400
- D. Secondary components:
1. Fasteners connecting System components: aluminum, non-magnetic stainless steel or other materials warranted by System manufacturer to be non-corrosive and compatible with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened. For concealed locations, provide System manufacturer's standard fasteners. Provide nuts and washers of design having means to prevent disengagement; deforming of fastener threads is unacceptable.
 2. Inserts, clips, adapters and other anchorage devices: use System manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes. Shop coat steel assemblies after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
 3. Internal reinforcement: ASTM A 36 for carbon steel or ASTM B 308 for structural aluminum; shapes and sizes to suit installation; all as necessary to meet structural design requirements of Paragraph 1.02. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.
 4. Shims: Non-staining, non-ferrous, type as recommended by System manufacturer.
 5. Protective coatings:
 - a. Cold applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat.
 - b. Alkyd type zinc chromate primer complying with FS TT-P-645.
 6. Internal (within confines of System) sealants: types recommended by sealant manufacturer to remain permanently elastic, tacky, non-drying, non-migrating and weathertight.
 7. Edge blocking: "Anti-walk", "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading. Edge blocking may be used for pressure plate systems.
 8. Sub-Sills: Manufacturer's standard products intended for use with specified system.
 9. Aluminum Window Sills: ASTM B221, alloy and temper 6063-T5, extruded aluminum having same finish and thickness of frames. Turn end up behind window frame.

10. Aluminum brake metal window sills, flashing and trim: ASTM B209, alloy 5005-H34 for sheets or other alloys and temper recommended by manufacturer and appropriate for specified finish formed to various dimensions and configurations as shown on drawings. Material thickness shall be as required to suit condition without deflection or "oil - canning" and in no case less than 0.062". Apply finish after forming.
11. Covers: "Snap-on" aluminum covers applied to pressure plate to show a sharp, uninterrupted exterior profile.
12. Glazing Gaskets: Provide resilient exterior and interior glazing gaskets retained in extruded races in framing members and exterior pressure plates; compression type design, replaceable, molded or extruded neoprene, or ethylene propylene diene monomer (EPDM). Comply with ASTM C509 or C864. Profile and hardness as necessary to maintain uniform pressure for watertight seal. Provide in manufacturer's standard black color. Factory molded corners required at exterior. Gaskets to maintain a full 1/4" separation between glass and aluminum members.
13. Other Components: Fasteners connection system to building structure: as determined by manufacturer's technical engineering department.

2.02 FABRICATION

A. General:

1. Fabricate components true to detail and free from defects. Fabricate to allow for accurate and rigid fit, hairline (except where expansion/contraction capability is to be provided) joints and corners. Ends shall be coped, mitered, milled or machined as appropriate. Match components carefully ensuring continuity of line and design. Ensure joints will be flush and weathertight. Ensure slip joints make full, tight contact and are weathertight. Members shall be securely fastened or joined to develop full structural value of System.
2. Provide major framing members factory assembled in basic rectangular units sized for ease of installation and transportation.
3. Reinforce components as required at anchorage and support points, at joints, and at attachment points for adjacent construction.
4. Drainage: Provide weep holes and drainage slots within glazing pockets to drain any condensation or accumulating water within the System to exterior.
5. Conceal fasteners wherever possible.
6. Through fasteners short circuiting thermal barrier are not permitted.
7. Allow for adequate clearance around perimeter of System to enable proper installation and for thermal movement within system. Bolts, screws, fasteners, anchors, metallic fastenings or other components, shall not impair independent frame movement.
8. Use of sealant materials shall be in strict accordance with ASTM Specifications for such materials.
9. Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.
10. Finish: Finish of exposed areas of aluminum windows and components shall be done in accord with the appropriate AAMA Voluntary Guide Specifications shown.

<u>Finish Designation</u>	<u>Color and Description</u>	<u>AAMA Specification</u>
AAM10C22A44	Class I Dark Bronze	611

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine the building structure over which System/components will be applied prior to commencing work. Conditions that would preclude proper installation of System shall be brought to the attention of the Contractor in writing.

- B. Ensure ambient and surface temperatures and joint conditions are suitable for materials to be installed.
- C. Commencement of installation shall signify acceptance of job site conditions.

3.02 INSTALLATION

- A. Set and install System framing members, entrances (doors) and windows plumb, level and true to line in proper alignment and relation to established lines and grades without warp or rack of frames meeting manufacturer's prescribed tolerances.
- B. Install in accordance with manufacturer's instructions and applicable provisions of AAMA Aluminum Storefront Design Manual.
- C. Unless otherwise specified, glazing shall be done in accordance with the recommendations of the FGMA Glazing Manual and applicable recommendations of AAMA Aluminum Curtain Walls, Manual Vol.6.
- D. Separate dissimilar materials at contact points, including metal in contact with dissimilar metal, masonry, concrete or other cementitious materials, with protective coating or preformed separators to prevent contact, electrolytic action and/or corrosion.
- E. Seal perimeter members to non-System building construction as shown in System manufacturer's installation instructions or as required for unique job conditions using tube sealant specified in Section 07 92 00. Set other members with internal sealants and baffles as called for in System manufacturer's installation instructions. The least possible dependence shall be placed on sealants and caulking materials. Use sealants as recommended by sealant manufacturer.
- F. Bolts, screws, fasteners, anchors, metallic fastenings or other components, shall not impair independent frame movement.
- G. Use sealant materials in strict accordance with ASTM Specifications for such materials. Ensure that joints, intersections, gaps, and other surfaces are made weathertight.

3.03 FIELD QUALITY CONTROL

- A. Materials shall be free from defects that would impair strength, durability, appearance, and functioning of the System, individual components, or related work. Defective materials shall be removed from the project site.
- B. Following installation, prior to glazing, manufacturer's factory representative shall inspect the System, including gaskets, for proper fit and assembly.
- C. Following completion of installation of System, glass, and perimeter seals (fully cured), water test in the presence of the Architect. Conduct test in accordance with procedures described in AAMA 501.2-94 Field Check of Metal Storefronts, Curtain Walls and Sloped Glazing Systems for Water Leakage.

3.04 PROTECTION AND CLEANING

Protect the work against damage during construction. Clean surfaces as required to remove corrosive substances. At the conclusion of construction, clean System to the satisfaction of the Architect. Provide written verification that cleaning agents are compatible with aluminum finishes, glass and glazing, and sealants and glazing gaskets. Advise Owner in writing of care and protection procedures required to maintain surfaces in like new condition.

END OF SECTION

**SECTION 08 71 00
FINISH HARDWARE**

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Finish hardware for doors as scheduled and specified herein, including:
 - a. Swinging doors.
 - b. Field verification, preparation, and modification of existing doors and frames to receive new finish hardware
2. Electro-mechanical devices and access control components as specified herein.
3. Any parts, components, materials, and accessories, whether specified or not, that are required for a complete and operational access control system. Provide access control system with features, capabilities, and operation at each door as specified herein.

B. Related Sections

1. Provide hardware complying with division 01 section "references" as well as the following publications to the extent referenced within this specification.
 - a. Division 08 Section: "Hollow Metal Doors and Frames"
 - b. Division 08 Section: "Wood Doors"
 - c. Division 08 Section: "Aluminum-Framed Entrances and Storefronts"
 - d. Division 08 Section: "Automatic Door Operators"
 - e. Division 28 Section: "Access Control"
 - f. Division 28 Section: "Fire Detection and Alarm Interfaces"

1.02 REFERENCED STANDARDS

A. Provide hardware in accordance with the following standards in addition to those specified in Division 01 Section "References."

1. American National Standards Institute (ANSI), A117.1: Accessible and Usable Buildings and Facilities, edition as adopted by local Authority Having Jurisdiction (AHJ).
2. Builders Hardware Manufacturer's Association (BHMA)
 - a. ANSI/BHMA A156.15: Release Devices – Closer Holder, Electromagnetic, and Electromechanical, 2011 edition
 - b. ANSI/BHMA A156.18: Materials and Finishes, 2006 edition
 - c. ANSI/BHMA A156.19: Power Assist and Low Energy Power Operated Doors, 2007 edition
3. Door and Hardware Institute (DHI)
 - a. Recommended Locations for Architectural Hardware for Flush Wood Doors, 1993 edition
 - b. Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames, 2004 edition
 - c. Installation Guide for Doors and Hardware, 1994 edition
 - d. Keying Systems and Nomenclature, 2003 edition
 - e. Sequence and Format for the Hardware Schedule, 2001 edition
4. National Fire Protection Association (NFPA)
 - a. NFPA 80: Standard for Fire Doors and Other Opening Protectives, edition as adopted by local AHJ.
 - b. NFPA 105: Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, edition as adopted by local AHJ.
 - c. NFPA 252: Standard Methods of Fire Tests of Door Assemblies, edition as adopted by local AHJ.

1.03 ADMINISTRATIVE REQUIREMENTS

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

A. Coordination

1. Coordinate layout, templating, and installation of work with other sections as required. Provide templates, product information, schedules, and diagrams required to fully coordinate the work.
 - a. Coordinate bollard mounted hardware with Division 05 Section "Metal Fabrications."
 - b. Coordinate blocking for wall stops and other surface-applied hardware with Division 06 Section "Rough Carpentry."
 - c. Coordinate hardware locations and templating with the appropriate Division 08 door and frame sections.
 - d. Coordinate conduit, raceways, wiring, and connection as required for electrical and pneumatic hardware items with the appropriate electrical, access control, intrusion detection, and fire alarm sections.
 - e. Fire Rated Openings: Coordinate with door and frame manufacturer to ensure that total opening complies with requirements for fire doors.

B. Pre-installation Meetings

1. Upon approval of hardware schedule and wiring diagram submittals and before hardware installation, conduct a pre-installation meeting complying with Division 01 Section "Project Management and Coordination."
2. Meeting attendees shall include the owner's representative, architect, contractor, hardware supplier, hardware installer, other affected trades, and manufacturer representative(s) for locks, exit hardware, operators, and closers.
3. Discuss the installation of continuous hinges, locksets, door closers, exit devices, electromechanical finish hardware, and finish hardware. Coordinate installation between trades.
 - a. Discuss special installation requirements.
 - b. Inspect and discuss electrical rough-in and other preparatory work performed by other trades.
 - c. Review sequence of operation for each electrified door opening.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - e. Review required testing, inspecting, and certifying procedures
4. At the meeting, distribute installation manuals, templates, wiring diagrams, and approved hardware schedule submittals to each attendee.
5. Notify participants at least five (5) working days before meeting.

C. Keying Conference

1. Upon approval of hardware schedule and before ordering locking hardware and key system, conduct a keying meeting complying with Division 01 Section "Project Management and Coordination."
2. Meeting attendees shall include the owner, owner's security consultant, construction manager, contractor, architect, and hardware supplier's Architectural Hardware Consultant.
3. Discuss key system requirements and incorporate decisions made during the meeting into the keying schedule submittal.
 - a. Review each locking function and determine degree of security required at each opening.
 - b. Review function of building, flow of traffic, and purpose of each area.
 - c. Determine degree of security at each opening.
 - d. Determine requirements for future expansion.
 - e. Discuss requirements for shipping and delivery of keys and cylinders/cores.
 - f. Discuss requirements to interface new cylinders/cores with owner's existing key system.

1.04 SUBMITTALS

A. General

1. Provide submittals in accordance with Division 01 Section "Submittal Procedures."
2. Advise architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

3. Submittals shall be prepared by or under the supervision of Architectural Hardware Consultant. Stamp submittals with the DHI certification seal and signature of the supervising Architectural Hardware Consultant.
 - a. Submittals submitted without the above certification seal shall be marked incomplete and returned.
 4. Submittal sequence: Submit product data, hardware schedule, samples, and qualification data concurrently. Coordinate submission of finish hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in project construction schedule. Upon approval of first submittal package, submit wiring diagrams and key schedule.
- B. Product Data
1. Submit manufacturer's technical product data for each item of finish hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 2. Highlight relevant product information such as model, function, trim, finish, options, electrical requirements, and accessories.
- C. Hardware Schedule
1. Submit hardware schedule detailing fabrication and assembly of finish hardware, as well as procedures and diagrams. Coordinate the final finish hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of finish hardware.
 2. Check specified hardware for suitability and adaptability to details and surrounding conditions. Indicate unsuitable or incompatible items and proposed substitutions.
 - a. Format schedule complying with the vertical format in DHI's "Sequence and Format for the Hardware Schedule" publication. Double space entries, and number and date each page. Use same scheduling sequence and door numbers as in the Contract Documents
 - b. Include the following information:
 - 1) Numerical door index indicating door number, heading number, and architect's specified hardware set number.
 - 2) Identification number, location, hand, fire rating and material of each door and frame.
 - 3) Type, style, function, size, quantity, and finish of each finish hardware item. Include description and function of each lockset and exit device.
 - 4) Complete designations of every item required for each door or opening including name and manufacturer.
 - 5) Fastenings and other pertinent information.
 - a) Where universal-type closers are scheduled, indicate the application method to be used for installation at each door (e.g. regular arm, parallel arm, or top jamb).
 - 6) Location of each finish hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 7) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 8) Mounting locations for finish hardware.
 - 9) Door and frame sizes and materials.
 - 10) Description of each electrified finish hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit; loss of power; fire alarm sounds.
 - 11) List of related door devices specified in other Sections for each door and frame.
 - c. Submit, with the hardware schedule, a list of lead times for hardware items.
- D. Keying Schedule
1. Submit keying schedule detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations complying with DHI's "Keying Systems and Nomenclature" publication.
- E. Shop Drawings

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

1. Submit details of electrified finish hardware, indicating the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
2. Detail interface between electrified finish hardware and fire alarm, access control, security building control system.
3. Operation Narrative: Describe the operation of doors controlled by electrified finish hardware.
4. Include specific cable requirements; indicate twisted, shielded, and plenum rated cable requirements where required by manufacture or relevant building codes and standards.

1.05 CLOSE OUT SUBMITTALS

A. General

1. Upon substantial completion, provide two (2) copies of the closeout submittals complying with Division 01 Section "Close Out Submittals."

B. Operation And Maintenance Data

1. Provide operation and maintenance manuals that include the following for each hardware item:
 - a. Project information including contact information for architect, contractor, supplier, installer, Architectural Hardware Consultant, and local representative of each hardware manufacturer
 - b. Complete information on care, maintenance, adjustment, repair and replacement of parts, and preservation of finishes
 - c. Product data, templates, installation information, service manual, and parts lists.
 - d. Copy of final hardware and keying schedules and wiring diagrams for each opening connected to either 120V or low voltage power. Edit schedules and diagrams to reflect "As installed" conditions.

C. Warranty Documentation

1. Provide information required for warranty service or replacement of each hardware item including:
 - a. Warranty certificates from manufacturer stating warranty period and conditions, complying with warranty requirements specified herein.
 - b. Copy of manufacturer's order confirmation or original packing slip with manufacturer's original order #, date of manufacture, and ship date.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Supplier Qualifications: Supplier shall have documented experience in the supply of finish hardware for five (5) years or for three (3) prior projects similar in scope, size, and quality. Supplier shall have an Architectural Hardware Consultant, complying with the requirements specified herein, available to properly handle, detail, and service hardware in a satisfactory manner. Architectural Hardware Consultant shall be available during the course of the work to consult with contractor, architect, and owner about finish hardware and keying.
 - a. Supplier shall be a certified direct distributor and be a full sales and service organization for the manufacturer(s) listed.
2. Installer Qualifications: Installer shall have documented experience in the installation of finish hardware for (5) years or for three (3) prior projects similar in scope, size, and quality.
3. Manufacturer Sourcing Qualifications: Obtain each type of finish hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
 - a. Provide electrified hardware from same manufacturer as mechanical finish hardware unless otherwise indicated. Manufacturer's that perform electrical modifications that are listed

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

by a testing and inspecting agency acceptable to authorities having jurisdiction (AHJ) are acceptable.

4. Architectural Hardware Consultant Qualifications: A person who is certified by DHI as an Architectural Hardware Consultant (AHC) or Architectural Openings Consultant (AOC) and is enrolled in the DHI Continuing Education Program. Consultant shall be experienced in providing consulting services for finish hardware installations that are comparable in material, design, and extent indicated.

B. Fire Door Assemblies

1. Provide finish hardware for fire rated openings that complies with NFPA 80 and the requirements of the AHJ. Provide only items of finish hardware that are listed by a testing and inspecting agency acceptable to the AHJ for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with fire-rated door and frame labels.
 - a. Where exit devices are required on fire rated doors (with supplementary marking on door label indicating "Fire Door to be Equipped with "Fire Exit Hardware"), provide label on exit device indicating "Fire Exit Hardware."
 - b. Provide proper latching hardware, non-flaming door closers, approved bearing type hinges, and required gasketing if not furnished with door or frame.

C. Smoke And Draft Control Door Assemblies

1. Where smoke and draft control door assemblies are required, provide finish hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Marking And Packaging

1. Package hardware items manufacturer's standard packaging, clearly marked with hardware set number correlating to finish hardware schedule and architect's door number.

B. Delivery And Acceptance

1. Coordinate with construction schedule and deliver packaged hardware items to place of installation (e.g. project site, fabrication shop). Upon delivery, inspect and inventory finish hardware. Immediately notify supplier of defective or missing items.
2. Deliver keys and cores to owner by registered mail or overnight package service. Ship keys separately from cores.

C. Storage And Handling

1. Provide secure, dry storage area complying with Division 01 Section "Product Storage and Handling Requirements" for finish hardware delivered to the project site, but not yet installed. Store items on shelves or pallets to prevent damage.
2. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.08 EXISTING CONDITIONS

1. Existing Openings: The Hardware Schedule is intended to indicate the required function and grade of hardware for each opening. Hardware Supplier to visit the existing building BEFORE BID DATE to inspect and confirm existing conditions and make adjustments to specified hardware to fit existing openings, including ADA requirements and hinge and strike locations/heights. Should any existing conditions conflict with hardware specified, they shall be brought to the Architect's attention in writing, prior to Bid Date. All existing building inspection information and subsequent changes shall be included in the Hardware Schedule submittal. Bidding the project will acknowledge that the required existing building inspection has been performed and that all items affecting cost have been brought to the Architect's attention. NO EXTRAS ALLOWED FOR "EXISTING CONDITIONS."

1.09 WARRANTY

A. General Warranty

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

1. Warrant finish hardware against defects in material and workmanship as set forth in Division 01 Section "Warranties."
 2. Special warranties specified herein shall not deprive owner of other rights specified in the contract documents, but shall be in addition to, and run concurrent with, other warranty requirements.
- B. Special Warranty
1. Provide a written warranty, executed by the product manufacturer agreeing to repair or replace components of finish hardware that fail in materials or workmanship within the specified warranty period.
 - a. Failures include, but are not limited to, the following:
 - 1) Structural failures including excessive deflection, cracking, or breakage.
 - 2) Faulty operation of operators and finish hardware.
 - 3) Deterioration of metals, metal finishes, and other materials beyond normal wear.
 - b. Warranty Period: Two (2) years from date of Substantial Completion, except for:
 - 1) Bored Locks: Ten (10) years from date of substantial completion
 - 2) Exit Devices: Ten (10) years from date of substantial completion
 - 3) Door Closers: Ten (10) years from date of substantial completion
 - 4) Auto Operators: Two (2) years from date of substantial completion
 - 5) Electrified Hardware
- Items: One (1) years from date of substantial completion

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Substitutions submitted, no later than 10 business days prior to bid and complying with Division 01 Section "Substitutions" requirements will be reviewed for conformance to basis of design. Substitutions found in compliance will be approved by bid addendum.

2.02 MATERIALS

- A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
- C. Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

2.03 FASTENERS

- A. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish stainless steel (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
- B. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Use through bolts only as indicated in this section unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

2.04 HINGES

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

A. Products that may be incorporated into the Work:

1. Ives: 5BB1 5BB1HW
2. Stanley: FBB179 FBB168
3. Bommer: BB5000 BB5004

B. Requirements:

1. Screws: Provide Phillips flat-head screws complying with the following requirements:
 - a. For metal doors and frames install machine screws into drilled and tapped holes.
 - b. For wood doors and frames install wood screws.
 - c. For fire-rated wood doors install #12 x 1-1/4-inch, threaded-to-the-head steel wood screws.
2. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Out-Swing Doors with Locks: Non-Removable Pins (NRP).
 - b. Interior Doors: Non-rising pins.
 - c. Tips: Flat button and matching plug, finished to match leaves.
3. Number of Hinges: At non-rated openings, provide two hinges for each door leaf 60 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof. At fire rated openings, provide no less than three ball bearing hinges for each door leaf 86 inches or less in height and one additional hinge for each 30 inches of additional height or portion thereof.
4. Hinge Width: Where applied trim or closer templating require hinge widths wider than 4-1/2 inches, provide minimum width required. Otherwise, provide hinges 4-1/2 inches in width.
5. Hinge Height: Provide hinges 5 inches in height where door leaf exceeds 3'0 in width or where door is a high-use door utilizing panic or push/pull hardware. Otherwise, provide hinges 4-1/2 inches in height.
6. Hinge Weight: Provide heavy weight hinges where door leaf exceeds 3'0 in width, exterior doors, and at doors scheduled with swing clear hinges, panic hardware, push/pull hardware, edge guards, or armor plates. Otherwise provide standard weight hinges.

2.05 CONTINUOUS HINGES

A. Products that may be incorporated into the Work:

1. Ives: 112HD
2. Select: SL11HD
3. McKinney: MCK-12HD

B. Requirements:

1. Geared Continuous Hinges: Shall utilize a single gear section for the door leaf and a separate gear section for the frame side of the door. Provide full mortise or surface applied hinge as scheduled in each set. Geared hinges are to be UL 10C tested and approved for 90 minutes.

2.06 ELECTRIC STRIKES

A. Products that may be incorporated into the Work:

1. Von Duprin: 6300 Series
2. HES: 9000 Series

B. Requirements:

1. Provide electric strikes with function (fail safe, fail secure) and power requirements as scheduled.
2. Where scheduled, provide electric strikes with monitor switches.

2.07 LOCKS AND LATCHES

A. Heavy Duty Bored Locks

1. Products that may be incorporated into the Work:
 - a. Falcon: K Series, Dane Lever
 - b. Corbin: CL3500 Series, NZD Lever

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

- Ruswin:
- c. Yale: 4700LN Series, AU Lever
2. Requirements:
- a. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1.
 - b. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with a 1/2 inch (13 mm) latch throw. Provide proper latch throw for UL listing at pairs. General Contractor to verify door thickness and backset at all existing doors prior to ordering locksets.
 - c. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
 - d. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
 - e. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 - f. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.

2.08 CYLINDERS AND KEYING

- A. Products that may be incorporated into the Work:
1. Falcon
- B. Requirements:
1. Small Format Interchangeable Cylinders: Provide cylinders of quantity and type and with the appropriate cam/tailpiece to be compatible with the locking hardware provided. Provide cylinder housings ready to accept 7-pin, Small Format Interchangeable Cores (SFIC).
 - a. Permanent Cores: Ship cores directly to owner's representative. At substantial completion, accompany the owner's representative while replacing temporary construction cores with the owner's permanent key system.
 2. Temporary Construction Keying: Provide each cylinder with temporary keying during the construction period. At substantial completion, accompany the owner's representative while voiding construction keying. Provide temporary construction keying to comply with the following:
 - a. Keyed Temporary Cores: Provide interchangeable core compatible cylinders and levers with keyed construction cores during the construction period. Cores will remain property of the contractor and will be returned upon installation of owner's permanent key system.
 3. Keys: Provide cylinder manufacturer's standard keys. Keys shall be shipped separate from cores directly to owner's representative. For estimating purposes, provide keys in the following quantities:
 - a. Construction Control Keys: 2 each
 - b. Construction Change Keys: 12 each
 - c. Permanent Control Keys: 2 each
 - d. Permanent Master Keys: 2 each
 - e. Permanent Change Keys: 4 per core

2.09 EXIT DEVICES

- A. Products that may be incorporated into the Work:
1. Falcon: 25/24 Series
 2. Sargent: 88 Series
 3. Precision: Apex 2100 Series
- B. Requirements:
1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware.
 2. Exit Devices: Touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
 3. Touchpad: Extend minimum of one half of door width. Match exit device finish or provide compatible finish. Provide compression springs in devices, latches, and outside trims or controls, tension springs also acceptable.
 4. Provide devices with deadlatching feature for security and for future addition of alarm kits and other electrical requirements.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

5. Provide manufacturer's standard strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
7. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
8. Provide hex key dogging at non-fire-rated exit devices.
9. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
10. Provide UL labeled fire exit hardware for fire rated openings.

2.10 MECHANICAL DOOR CLOSERS

A. General:

1. Valves: Closers shall have separate valves for latch speed, main speed, and back check. Valves shall be staked to prevent accidental removal. Internal Pressure Relief Valves (PRVs) are prohibited. Provide the appropriate closer body, handing, and brackets to mount closer inside the building on the least-public side of the door.
 - a. Where closers are to be mounted parallel arm, provide with heavy duty, fully forged arms.
 - b. Where closers are to be mounted regular arm and the opening can otherwise be opened to 180 degrees, provide closer with the appropriate special templating to allow 180 degree door swing. Where a special template is not available for 180 degree swing, provide closer arm with integrated stop.
2. Integrated Stop Closer Arms: Where a closer with integrated stop is required, provide the appropriate closer and arm as follows:
 - a. Parallel arm with spring-cushioned stop arm: Provide where door is otherwise able to open to 95 degrees and requires a parallel arm mount closer.
 - b. Parallel arm with dead stop arm: Provide where door is obstructed from opening to 95 degrees and requires a parallel arm mount closer.
 - c. Regular arm with push side surface-mounted overhead stop: Provide where door closer should mount on pull side of door.
3. Hold Open Arms: Provide closer arms with mechanical hold-opens as scheduled.
4. Provide closers with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware. Provide closers with screw packs containing thru-bolts, machine screws, and wood screws.
5. Closers shall be provided with all-weather fluid and shall not require readjustment from 120 degrees F to -30 degrees F. Fluid shall be non-flaming and shall not fuel door or floor covering fires. Upon request, provide data indicating thermal properties of fluid.
6. Closers shall close and latch door when adjusted to meet accessibility requirements for door opening force: 8.5 lbs at exterior doors, 5 lbs at interior doors, and 15 lbs at labeled fire doors.

B. Heavy Duty Door Closers:

1. Products that may be incorporated into the Work:
 - a. Falcon: SC71
 - b. Yale: 400
 - c. Norton: 7500
2. Requirements:
 - a. Closer Construction: Closer shall have or aluminum alloy body with 1-1/2 inch steel piston, double heat treated pinion, 5/8 inch bearing journals.
 - b. Closer shall be adjustable from sizes 1 through 6.
 - c. Provide closers with spring size adjustment dial for ease of adjusting.

C. Standard Duty Door Closers:

1. Products that may be incorporated into the Work:
 - a. Falcon: SC81

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

- b. Yale: 3000
- c. Norton: 8000
- 2. Requirements:
 - a. Closer Construction: Closer shall have or aluminum alloy body with 1-1/4 inch steel piston, double heat treated pinion, 5/8 inch bearing journals.
 - b. Closer shall be adjustable from sizes 1 through 6.

2.11 CLOSER RELEASE DEVICES

- A. Products that may be incorporated into the Work:
 - 1. LCN: SEM7800 Series
 - 2. Rixson: 900 Series
- B. Requirements:
 - 1. Provide 35 pound electro-magnetic hold open device constructed of die cast metal or plastic. Electromagnet shall accept 120VAC, 24VDC, and/or 12VDC power from fire alarm. Provide mounting style as scheduled.

2.12 AUTOMATIC OPERATORS (ELECTRO-HYDRAULIC)

- A. Products that may be incorporated into the Work:
 - 1. LCN: 4600 Series
 - 2. Sargent: MPower 3000 Series
 - 3. Norton: 6900 Series
- B. Requirements:
 - 1. Provide low energy automatic operator units with hydraulic closer complying with ANSI A156.19.
 - 2. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door.
 - a. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 3. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
 - 4. Provide drop plates, brackets, or adapters for arms as required for details.
 - 5. Provide actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
 - 6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf.
 - 7. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.13 ARCHITECTURAL DOOR TRIM

- A. Protection Plates
 - 1. Products that may be incorporated into the Work:
 - a. Ives: 8400 Series
 - b. Rockwood: K1050
 - c. Trimco: K Series
 - 2. Requirements:
 - a. Provide .050 inch thick stainless steel protection plates with height as scheduled. Plate shall have four beveled edges. Provide no screw holes and adhesive as required by door manufacturer's fire labeling requirements. Otherwise provide plate manufacturer's standard countersunk fasteners.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

- b. Provide plate with width as follows:
 - 1) Pairs of Doors: Where door is scheduled with edge guards, provide plate to be 2 inches less door width, otherwise provide plate to be 1 inch less door width.
 - 2) Single Doors: Provide plate to be 2 inches less door width on push side, pull side mounted plates to be 1 inch less door width.

B. Door Stops and Holders

- 1. Products that may be incorporated into the Work:
 - a. Ives: WS407
 - b. Rockwell: 405/406
 - c. Trimco: 1270
- 2. Requirements:
 - a. Provide stops and holders as indicated in the HW sets.
 - b. Where wall bumpers are scheduled, provide concave rubber bumper where the adjacent lever trim incorporates a push-button. Otherwise, provide convex rubber bumpers.

2.14 OVERHEAD STOPS AND HOLDERS

A. Products that may be incorporated into the Work:

- 1. Glynn
 - Johnson: 100 Series 90 Series
- 2. Rixson-
 - Firemark: 6 Series 9 Series

B. Requirements:

- 1. Provide overhead stops and holders as scheduled, sized per manufacturer's recommendations based on door width.
- 2. Provide concealed overhead stops with adjustable jamb bracket.
- 3. Where possible without conflicting with other hardware, mount surface overhead stops on least public side of door.
- 4. Provide stops with any special templates, brackets, plates, or other accessories required for interface with header, door, wall, and other hardware.

2.15 SADDLE AND PANIC THRESHOLDS

A. Manufacturers that may be incorporated into the Work:

- 1. Zero International
- 2. National Guard
- 3. Pemko

B. Requirements:

- 1. Provide saddle thresholds with length equal to the width of the opening.
- 2. Provide stainless steel machine screws and lead anchors for each threshold.

2.16 WEATHERSTRIP AND GASKET

A. General:

- 1. Provide weather strip and gasketing as scheduled.
- 2. Size weather strip and gasket to provide a continuous seal around opening and at meeting stiles.

B. Perimeter Seals

- 1. Manufacturers that may be incorporated into the Work:
 - a. Zero
 - b. National

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

- Guard
- c. Pemko
- C. Door Bottoms
- 1. Manufacturers that may be incorporated into the Work:
 - a. Zero
 - b. National
- Guard
- c. Pemko
- D. Rain Drips
- 1. Manufacturers that may be incorporated into the Work:
 - a. Zero
 - b. National
- Guard
- c. Pemko

2.17 MISCELLANEOUS HARDWARE

- A. Silencers
- 1. Products that may be incorporated into the Work:
 - a. Ives: SR64
 - b. Rockwood: 608
 - c. Trimco: 1229A
- 2. Requirements:
 - a. Where indicated on single openings, provide 3 each grey rubber silencers on lock jamb.
 - b. Where indicated on paired openings, provide 2 each grey rubber silencers on header.
 - c. Where indicated on Dutch Door openings, provide 4 each grey rubber silencers on lock jamb.
- B. Lock Guards
- 1. Products that may be incorporated into the Work:
 - a. Ives: LG12
 - b. Rockwood: 321
 - c. Trimco: 5002
- 2. Requirements:
 - a. Provide lock guards as scheduled.
 - b. Provide through bolt fasteners at all lock guards.

2.18 ELECTRONIC ACCESSORIES

- A. Power Supplies
- 1. Products that may be incorporated into the Work:
 - a. Schlage Electronics: PS900 Series
 - b. Securitron: BPS Series
 - c. Security Door Controls: 600 Series
- 2. Requirements:
 - a. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
 - b. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
 - c. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.
 - d. Options: Provide the following options.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

- 1) Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
 - 2) Provide sealed batteries for battery back-up at each power supply where specified.
 - 3) Provide keyed power supply cabinet.
 - 4) Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.
- e. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

2.19 HIGH SECURITY EMERGENCY KEY BOX

- A. Products that may be incorporated into the Work:
1. Knox, Inc. 3200 Series x RMK
 2. Substitutions as approved by Architect/Owner
- B. Requirements:
1. Provide recess-mounted emergency key box as approved by the local fire jurisdiction. Key box to be master-keyed as dictated by local fire jurisdiction.

2.20 KEY CONTROL CABINET

- A. Products that may be incorporated into the Work:
1. Lund, Inc. 1200 Series
 2. Substitutions as approved by Architect/Owner
- B. Requirements:
1. Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet.
 2. Provide complete cross-index system set up by Owner and place keys on markers and hooks in the cabinet as determined by the final key schedule.
 3. Provide hinged-panel type cabinet for wall mounting.

2.21 FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and locksets (or push-pull units if no latch or locksets).
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes," including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.
- D. The designations used in schedules and elsewhere to indicate hardware finishes are the industry-recognized standard commercial finishes, except as otherwise noted.
1. Brushed Chrome and/or Stainless Steel Appearance
 - a. Brushed Stainless Steel, no coating: ANSI 630.
 - b. Satin Chrome, Clear Coated: ANSI 626, ANSI 652.
 - c. Powder Coated Aluminum finish: ANSI 689.
 - d. Saddle and Panic Thresholds: Mill Aluminum finish.
 - e. Weatherstrip and Gasket: Clear Anodized Aluminum finish.

PART 3 - EXECUTION

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

3.01 EXAMINATION

- A. Verify conditions of walls, flooring, doors, frames, and hardware are satisfactory for installation of hardware.
 - 1. Prior to installing doors and hardware, wash down of masonry and painting or staining of doors and frames shall be completed.
 - 2. Verify that walls have blocking behind wall mounted stop locations.
 - 3. Verify that flooring does not interfere with door or hardware operation.
 - 4. Ensure that frames are installed plumb, square, and true. Verify that doors and frames are properly sized and handed and are correctly prepared for hardware installation.
 - 5. Verify function, quantity, type, hand, and finish of hardware to be installed with the approved hardware schedule.
 - 6. Verify that electrical rough-in is complete and correctly located for each door.
- B. Conditions that do not allow proper installation of hardware shall be corrected before proceeding.

3.02 INSTALLATION

- A. General
 - 1. Install door hardware as detailed in the approved hardware schedule using only approved fasteners and in accordance with manufacturer's recommended procedures and methods.
 - 2. Install hardware and signage at fire rated openings in accordance with NFPA 80 requirements.
- B. Hardware Mounting Heights
 - 1. Mount door hardware units at heights indicated, as follows, unless otherwise indicated or required to comply with governing regulations.
 - a. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - b. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - c. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- C. Clearances
 - 1. Install doors, both rated and non-rated, in accordance with NFPA 80 requirements for door clearances as follows:
 - a. 1/8 inch between door and frame head and jambs for wood doors
 - b. 3/8 inch between door and frame head and jambs for metal doors
 - c. 1/8 inch at meeting stiles of pairs of doors.
 - d. 3/4 inch undercut maximum.
- D. Surface Mounted Door Closers
 - 1. Install surface mounted door closers on room side of openings, except where prohibited by scheduled hardware. Use appropriate arms, spacers, brackets, and accessories to properly install surface mounted door closers. Adjust spring power to the appropriate setting to ensure the doors reliably close under normal operating conditions.
- E. Wall Mounted Door Stops And Holders
 - 1. Locate wall mounted door stops at the appropriate height and location to properly contact protruding door trim.
- F. Gasketing
 - 1. Install gasketing to provide a continuous seal around the perimeter of the opening. Install soffit mounted hardware using the proper brackets, spacers, and accessories to allow proper installation without cutting or notching gasketing material or mounting channels.
- G. Thresholds And Saddles
 - 1. Trim, cut, and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Thresholds and saddles shall be set in full bed of butyl-rubber or polyisobutylene mastic sealant.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

3.03 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Architect will engage a qualified Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
- B. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.04 ADJUSTING

- A. After building HVAC system is balanced and adjusted, conduct final adjustment of door closers. Verify spring power of the surface mounted door closer is properly adjusted to close and latch the door and to comply with the opening force requirements of ANSI A117.1 as follows:
 - 1. Doors with Closers shall take five (5) seconds to close from 90 degrees to 12 degrees.
 - 2. Interior, non-fire rated swinging doors shall open with a maximum of 5 lbs of pressure.
 - 3. Exterior doors and fire rated doors shall open with the minimum amount of pressure required to positively close and latch the door.

3.05 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.06 SCHEDULE

- A. The following schedule of hardware sets shall be considered a guide and the supplier is cautioned to refer to general conditions, special conditions, and the full requirements of this section. It shall be the hardware supplier's responsibility to furnish all required hardware.
- B. Where items of hardware are not definitely or correctly specified and are required for completion of the Work, a written statement of such omission, error, conflict, or other discrepancy shall be sent to the Architect, prior to date specified for receipt of bids, for clarification by addendum.
- C. Adjustments to the Contract Sum will not be allowed for omissions or items of hardware not clarified prior to bid opening.

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

Hardware Group No. 005

For use on mark/door #(s):

112B

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 SET	HINGE(S)	5BB1 (WT, SIZE, NRP AS REQUIRED)	630	IVE
1 EA	PANIC HARDWARE	25-R-NL	626	FAL
1 EA	MORTISE CYLINDER	C987	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	ELECTRIC STRIKE	6300 FSE	630	VON
1 EA	SURFACE CLOSER (W/ SPRING STOP)	SC71 SS	689	FAL
1 EA	TOP RAIL DROP PLATE	SC70-18PA AS REQ'D	689	FAL
1 EA	RAIN DRIP	142A	AL	ZER
1 EA	GASKETING	429A	A	ZER
1 EA	DOOR SWEEP	8198AA	AA	ZER
1 EA	THRESHOLD	8655A/ AS REQ'D BY SILL CONDITIONS	A	ZER
1 EA	MULTITECH READER	BY SECURITY CONTRACTOR - MT11	BLK	SCE
1 EA	DESK MOUNT BUTTON	BY SECURITY CONTRACTOR - 660-PB	628	SCE
1 EA	POWER SUPPLY	BY SECURITY CONTRACTOR - PS902 900- 4R	LGR	VON
1 SET	WIRING DIAGRAMS	AS REQUIRED		

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RELEASES STRIKE ALLOWING ENTRY.
3. SIGNAL FROM REMOTE RELEASE SYSTEM, MOMENTARILY RELEASES STRIKE, ALLOWING ENTRY..
4. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
 COLORADO SPRINGS, CO

SECTION 08 71 00
 FINISH HARDWARE

Hardware Group No. 010

For use on mark/door #(s):

121B

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	CYLINDER HOUSING	RIM/MORTISE AS REQ'D BY EXISTING PANIC DEVICE	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

Hardware Group No. 015

For use on mark/door #(s):

116A 124A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

Hardware Group No. 020

For use on mark/door #(s):

117A 118A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	ENTRY/OFFICE	K511HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

Hardware Group No. 025

For use on mark/door #(s):

116B 126A 129A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

Hardware Group No. 030

For use on mark/door #(s):

127A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

Hardware Group No. 035

For use on mark/door #(s):

125A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

Hardware Group No. 040

For use on mark/door #(s):

123A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	CLASSROOM	K561HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL

- A) AT EXISTING DOORS/FRAMES, GENERAL CONTRACTOR AND HARDWARE SUPPLIER TO FIELD VERIFY EXISTING CONDITIONS TO ENSURE THE COMPATIBILITY OF NEW HARDWARE WITH EXISTING PREPS PRIOR TO ORDER OF NEW MATERIALS. GENERAL CONTRACTOR TO PROVIDE NECESSARY FILLERS, REINFORCEMENTS AND FASTENERS, COMPATIBLE WITH EXISTING MATERIALS AS REQUIRED FOR MOUNTING NEW OPENING HARDWARE AND TO COVER EXISTING DOOR AND FRAME PREPARATIONS.

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

Hardware Group No. 100

For use on mark/door #(s):

100A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	CONT. HINGE	112HD	628	IVE
1 EA	PANIC HARDWARE	25-R-NL	626	FAL
1 EA	MORTISE CYLINDER	C987	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	ELECTRIC STRIKE	6300 FSE	630	VON
1 EA	CONCEALED MOUNT OH STOP	100S ADJ	630	GLY
1 EA	SURF. AUTO OPERATOR	4642 CS WMS (USE FLUSH CEILING MOUNT)	689	LCN
1 EA	WEATHER RING	8310-800	BLK	LCN
2 EA	HARDWIRED ACTUATOR	8310-856T	630	LCN
2 EA	FLUSH MOUNT BOX	8310-868F	689	LCN
1 SET	SEALS	BY ALUM DOOR/FRAME MFG		
1 EA	DOOR SWEEP	BY ALUM DOOR/FRAME MFG		
1 EA	THRESHOLD	BY ALUM DOOR/FRAME MFG		
1 EA	MULTITECH READER	BY SECURITY CONTRACTOR - MT11	BLK	SCE
1 EA	DESK MOUNT BUTTON	BY SECURITY CONTRACTOR - 660-PB	628	SCE
1 EA	POWER SUPPLY	BY SECURITY CONTRACTOR - PS902 900- 4R	LGR	VON
1 SET	WIRING DIAGRAMS	AS REQUIRED		

A) SHARE POWER SUPPLY WITH DOOR 101A.

B) ARCHITECT TO COORDINATE WHERE ACTUATORS ARE TO BE LOCATED.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. AUTHORIZED CREDENTIAL MOMENTARILY RELEASES STRIKE ALLOWING ENTRY.
3. DURING OPEN HOURS (DETERMINED BY OWNER), ACCESS CONTROL SYSTEM TIME CLOCK ELECTRICALLY KEEPS STRIKE RELEASED, ALLOWING ENTRY.
4. SIGNAL FROM REMOTE RELEASE SYSTEM, MOMENTARILY RELEASES STRIKE, ALLOWING ENTRY.
5. OUTER ACTUATOR IS DISABLED AFTER HOURS BY ACCESS CONTROL TIME CLOCK. VALID CREDENTIAL AT CARD READER ENABLES ACTUATOR.
6. INNER ACTUATOR IS ALWAYS ENABLED.
7. IF DOOR IS LATCHED WHEN INNER ACTUATOR IS DEPRESSED, OPERATOR RELEASES ELECTRIC STRIKE PRIOR TO OPENING.
8. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
 COLORADO SPRINGS, CO

SECTION 08 71 00
 FINISH HARDWARE

Hardware Group No. 105

For use on mark/door #(s):

101A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
1 EA	CONT. HINGE	112HD	628	IVE
1 EA	PANIC HARDWARE	25-R-NL	626	FAL
1 EA	MORTISE CYLINDER	C987	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	ELECTRIC STRIKE	6300 FSE	630	VON
1 EA	CONCEALED MOUNT OH STOP	100S ADJ	630	GLY
1 EA	SURF. AUTO OPERATOR	4642 CS WMS (USE FLUSH CEILING MOUNT)	689	LCN
2 EA	HARDWIRED ACTUATOR	8310-856T	630	LCN
2 EA	FLUSH MOUNT BOX	8310-868F	689	LCN
1 SET	SEALS	BY ALUM DOOR/FRAME MFG		
1 EA	DESK MOUNT BUTTON	BY SECURITY CONTRACTOR - 660-PB	628	SCE
1 SET	WIRING DIAGRAMS	AS REQUIRED		

A) POWER SUPPLY LOCATED IN HARDWARE SET 01.

B) ARCHITECT TO COORDINATE WHERE ACTUATORS ARE TO BE LOCATED.

OPERATIONAL DESCRIPTION

1. FREE EGRESS AT ALL TIMES.
2. DURING OPEN HOURS (DETERMINED BY OWNER), ACCESS CONTROL SYSTEM TIME CLOCK ELECTRICALLY KEEPS STRIKE RELEASED, ALLOWING ENTRY.
3. SIGNAL FROM REMOTE RELEASE SYSTEM, MOMENTARILY RELEASES STRIKE, ALLOWING ENTRY.
4. OUTER ACTUATOR IS DISABLED AFTER HOURS BY ACCESS CONTROL TIME CLOCK.
5. INNER ACTUATOR IS ALWAYS ENABLED.
6. IF DOOR IS LATCHED WHEN INNER ACTUATOR IS DEPRESSED, OPERATOR RELEASES ELECTRIC STRIKE PRIOR TO OPENING.
7. ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

Hardware Group No. 200

For use on mark/door #(s):

109A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1 EA	CLASSROOM	K561HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	LOCK GUARD	LG12	630	IVE
1 EA	SURFACE CLOSER (W/ SPRING STOP)	SC71 SS	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	RAIN DRIP	142A	AL	ZER
1 EA	GASKETING	429A	A	ZER
1 EA	DOOR SWEEP	8198AA	AA	ZER
1 EA	THRESHOLD	8655A/ AS REQ'D BY SILL CONDITIONS	A	ZER

Hardware Group No. 205

For use on mark/door #(s):

110A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	LOCK GUARD	LG12	630	IVE
1 EA	SURFACE CLOSER (W/ DEAD STOP)	SC71 DS	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	RAIN DRIP	142A	AL	ZER
1 EA	GASKETING	429A	A	ZER
1 EA	DOOR SWEEP	8198AA	AA	ZER
1 EA	THRESHOLD	8655A/ AS REQ'D BY SILL CONDITIONS	A	ZER

Hardware Group No. 300

For use on mark/door #(s):

112A

121A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	FIRE EXIT HARDWARE	F-25-R-L-DANE-SNB	626	FAL
1 EA	MORTISE CYLINDER	C987	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER	SC81 RW/PA	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1 EA	GASKETING	188S-BK	S-BK	ZER

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
 COLORADO SPRINGS, CO

SECTION 08 71 00
 FINISH HARDWARE

Hardware Group No. 300.1

For use on mark/door #(s):

120A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	FIRE EXIT HARDWARE	F-25-R-L-DANE-SNB	626	FAL
1 EA	MORTISE CYLINDER	C987	626	FAL
1 EA	SFIC CONST. CORE	C607CCA		FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER (W/ SPRING STOP)	SC81 SS	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	GASKETING	188S-BK	S-BK	ZER

Hardware Group No. 305

For use on mark/door #(s):

102A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	CLASSROOM	K561HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER	SC81 RW/PA	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1 EA	GASKETING	188S-BK	S-BK	ZER

Hardware Group No. 310

For use on mark/door #(s):

105A

106A

107A

108A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	CLASSROOM	K561HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER	SC81 RW/PA	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	GASKETING	188S-BK	S-BK	ZER

SECTION 08 71 00
FINISH HARDWARE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

Hardware Group No. 315

For use on mark/door #(s):

111A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER (W/ DEAD STOP)	SC81 DS	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	GASKETING	188S-BK	S-BK	ZER

Hardware Group No. 320

For use on mark/door #(s):

131A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	STOREROOM	K581HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	SURFACE CLOSER	SC81 REG OR PA AS REQ	689	FAL
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP	WS406/407CCV	630	IVE
1 EA	GASKETING	188S-BK	S-BK	ZER

Hardware Group No. 500

For use on mark/door #(s):

113A 114A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	ENTRY/OFFICE	K511HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	WALL STOP	WS406/407CCV	630	IVE
3 EA	SILENCER	SR64	GY	IVE

Hardware Group No. 505

For use on mark/door #(s):

115A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	CLASSROOM	K561HD7 DANE	626	FAL
1 EA	SFIC CORE	C607	626	FAL
1 EA	WALL STOP	WS406/407CCV	630	IVE
3 EA	SILENCER	SR64	GY	IVE

DEERFIELD HILLS COMMUNITY CENTER ADDITIONS
COLORADO SPRINGS, CO

SECTION 08 71 00
FINISH HARDWARE

Hardware Group No. 615

For use on mark/door #(s):

103A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
4 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	DUTCH DOOR BOLT	054	626	IVE
1 EA	PASSAGE	K101S DANE	626	FAL
2 EA	WALL STOP	WS406/407CCV	630	IVE
4 EA	SILENCER	SR64	GY	IVE

A) DUTCH DOOR.

B) DUTCH DOOR SHELF BY DUTCH DOOR MANUFACTURER.

Hardware Group No. 800

For use on mark/door #(s):

130A

EACH TO HAVE:

<u>Qty</u>	<u>Description</u>	<u>Catalog Number</u>	<u>FIN</u>	<u>Mfr</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	PRIVACY	K301S DANE	626	FAL
1 EA	SURFACE MOUNT OH STOP	90S	630	GLY
3 EA	SILENCER	SR64	GY	IVE

END OF SECTION

SECTION 08 81 00 GLAZING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Glass and Glazing
 - 2. Glazing Materials
 - 3. Display Case, Sliding Window System, Shelves, and Shelf Hardware

- B. Products Installed But Not Furnished Under This Section:
 - 1. Hollow Metal Window and Door Glazing Stops: Section 08 11 13
 - 2. Aluminum Window Glazing Stops: Section 08 41 13
 - 3. Wood Door Glazing Frames: Section 08 14 29

- C. Related Sections:
 - 1. Steel Doors and Frames: Section 08 11 13
 - 2. Prefinished Wood Doors: Section 08 14 29
 - 3. Aluminum Storefront Framing: Section 08 43 13

1.02 REFERENCE STANDARDS

Comply with published standards of Glass Association of North America – Glazing Manual, latest edition, and all applicable manufacturer's recommendations.

1.03 SUBMITTALS

- A. Samples: Submit one 12" x 12" sample of each type of glass to Architect with label indicating name of glass manufacturer / supplier.

- B. Product Data: Submit product data as specified in Sections 01 33 00 and 01 33 23, establish specified design and performance characteristics for each type of glass.

- C. Contract Closeout Submittals: Submit written warranty specified under Article 1.07.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: UL or Warnock-Hersey Classification is required for fire-rated impact safety glass. In addition, fire-rated impact safety glazing material shall comply with safety glazing requirements of CPSC 16 CFR Part 1201 and be permanently marked as required by local jurisdictions. Impact safety rated glass shall meet CPSC Category II criteria of 400 ft/lbs.

- B. Insulated Glass: Units shall be double sealed, single seal is not acceptable. Insulated glass units shall meet performance requirements of ASTM E2190. Insulating glass units shall be manufactured by member of Insulating Glass Certification Council (IGCC) or Insulating Glass Manufacturers Association (IGMA).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimal handling of glazing is required.

- B. Storage: Store glazing according to manufacturer's / supplier's printed instructions. Store in areas least subject to traffic or falling objects. Keep storage area clean and dry. Stack individual glazing panels on edge, leaned slightly against upright supports with separators between each panel.

1.06 PROJECT CONDITIONS

- A. Protection: Glass shall be completely covered during spray painting, plastering, or other construction operations that might cause damage to glass.
- B. Breakage: Contractor shall be responsible for all glass broken during shipment, storage and installation.

1.07 WARRANTY

Insulated glass units in vertical application shall have ten (10) year written warranty against seal failure. Insulated glass units in sloped glazing systems shall have five (5) year written warranty against seal failure.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manufacturers or Suppliers - Glass:
 - 1. PPG Industries, Inc.
 - 2. Viracon, Inc.
 - 3. Oldcastle Glass
 - 4. AGC Flat Glass North America
 - 5. Pilkington North America
 - 6. Guardian Industries
 - 7. Northwestern Industries, Inc.
 - 8. approved substitute
- B. Manufacturers - Insulated Glass Units:
 - 1. PPG Industries, Inc.
 - 2. Viracon, Inc.
 - 3. Oldcastle Glass
 - 4. AGC Flat Glass North, Inc.
 - 5. Pilkington North America
 - 6. Guardian Industries
 - 7. Northwestern Industries, Inc.
 - 8. approved substitute
- C. Suppliers - Tempered Glass:
 - 1. PPG Industries, Inc.
 - 2. Viracon, Inc.
 - 3. Oldcastle Glass
 - 4. AGC Flat Glass North, Inc
 - 5. Pilkington North America
 - 6. Guardian Industries
 - 7. Northwestern Industries, Inc.
 - 8. approved substitute
- D. Manufacturers – Fire Rated Glass:
 - C. Technical Glass Products (TGP)
 - D. Vetrotech, Saint-Gobain
 - E. SAFTI, a division of O’Keefe’s Inc.
 - F. approved substitute
- G. Labels: Every individual piece of glass shall bear a label designating type, thickness and quality. Do not remove labels until observed by Architect.

2.02 GLASS TYPES

Glass types indicated on the drawings shall be one of the following types of glass. Glass thickness indicated below is nominal, performance requirements are minimal.

TYPE	DESCRIPTION
------	-------------

- | | |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. | View Windows – High Performance Glazing
1" thickness insulating glass unit with 1/2" airspace. By PPG or acceptable equivalent of other manufacturer. Visible Light Transmittance 42%. Shading Coefficient 0.31. Summer U-Value 0.27. Solar Heat Gain Coefficient 0.27.
Outside Lite: <ol style="list-style-type: none">1. 1/4" Solarban 60 Solarbronze tinted2. Heat strengthened3. Low-E Coating on the #2 Surface Inside Lite: <ol style="list-style-type: none">1. 1/4" clear. |
| AT. | View Windows – High Performance Glazing (Tempered)
1" thickness insulating glass unit with 1/2" airspace. By PPG or acceptable equivalent of other manufacturer. Visible Light Transmittance 42%. Shading Coefficient 0.31. Summer U-Value 0.27. Solar Heat Gain Coefficient 0.27.
Outside Lite: <ol style="list-style-type: none">1. 1/4" Solarban 60 Solarbronze tinted2. Heat strengthened3. Low-E Coating on the #2 Surface Inside Lite: <ol style="list-style-type: none">1. 1/4" clear.2. Tempered |
| B. | Exterior Door Glazing
1/2" laminated glass unit
Two layers of 1/4" thickness glass with a 0.030 mm interlayer lamination film between the layers. By PPG or acceptable equivalent of other manufacturer, to match Glass Type A .
Inside Glass Layer: <ol style="list-style-type: none">1. 1/4" clear2. Tempered Outside Glass Layer: <ol style="list-style-type: none">1. 1/4" PPG Solarbronze tinted2. Tempered |
| C. | 1/4" clear. |
| CT. | 1/4" clear tempered. |
| F. | Fire Rated Impact Safety Glass (20 Min):
Fireglass20 as manufactured by J.R. Four, Ltd. and distributed by Technical Glass Products, or acceptable equivalent of other manufacturer. <ol style="list-style-type: none">1. Fire-rating: 20 minutes.2. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).3. Thickness: 1/4 inch or as required by manufacturer for required fire rating. |
| G. | Fire Rated Impact Safety Glass (45 Min): |

Firelite NT as manufactured by J.R. Four, LTD. and distributed by Technical Glass Products, or acceptable equivalent of other manufacturer.

1. Fire-rating: 45 minutes.
2. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
3. Thickness: 1/4 inch or as required by manufacturer for required fire rating.

2.03 GLAZING

- A. Glazing Tape System: Closed cell, flexible, self-adhered, non-extruding polyvinyl chloride (PVC) foam as recommended by glass manufacturer.
- B. Setting Blocks, Shims, and Glazing Clips: Size and type as recommended by glass manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

Before glazing, verify that frames are plumb and square with metal stops set for proper glass-to-stop face clearance. Report frame defects or unsuitable conditions to Contractor before proceeding.

3.02 PREPARATION

Openings shall be field measured before ordering neoprene gaskets or tempered glass products. Contractor shall bear sole responsibility for proper fit of field measured products.

3.03 INSTALLATION

- A. Stops: Glass is to be held in place with metal stops as detailed. Glazing frames or stops will be furnished under other sections of these Specifications. Carefully remove factory set stops already in place as necessary to permit the glazing. Stops shall be handled carefully and properly installed without damage to same.
 - B. Glazing In-Hollow Metal Frames: The opening to be glazed must first be taped to prevent the glass from touching the metal in any direction. Center glass in glazing rabbet to maintain recommended clearances at perimeter on all four sides, inside and out. Rest glass panes on setting blocks as recommended by the glass manufacturer. Install shims or use shim tape as recommended to maintain clearance between stops and face of glass. Install glazing tape. Stop in with metal stops as specified above. Cover top of tape with joint sealant on exterior side of exterior windows in accordance with Section 07920. Leave sealant smooth and clean. Remove sealant from adjoining surfaces without damaging the finish.
 1. Cut glass with smooth, straight edges of full size required by the openings. Edge clearances shall comply with Flat Glass Marketing Association Standards.
 - C. Glazing in Aluminum Windows: Install glass on setting blocks as recommended by the window or door manufacturer. Dry glaze using glass retainers providing resilient clamping grip on glass or glaze with elastic glazing compound as required.
 - D. Allowable Tolerances: Maintain minimum glazing tolerance between glass faces and frame or metal stops as recommended by the Flat Glass Marketing Association. For 1/4" thickness glass, maintain 1/8" clearance between glass face and metal stops.
- 3.05 FIRE RATED GLAZING
Set Fire Rated Glazing in specified rated frame assembly as detailed and recommended by manufacturer for specified 20 and 45 minute ratings.
- 3.05 CLEANING
Leave glazing in a job-clean condition. Final cleaning shall be done under Section 01 74 23.

END OF SECTION

Not for Construction

SECTION 09 21 00 GYPSUM BOARD PARTITIONS AND WALLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Gypsum Board
 - 2. Acoustical Insulation
 - 3. Abuse-Resistant Gypsum Board
 - 4. Water-Resistant Gypsum Board
 - 5. Cement Board
 - 6. Joint Treatment System, Trim, and Accessories
- B. Items Installed But Not Furnished Under This Section: Access Doors: Section 08 31 13.
- C. Related Sections:
 - 1. Gypsum Board Ceilings: Section 09 21 10
 - 2. Painting: Section 09 91 00
 - 3. Joint Sealants: Section 07 92 00

1.02 REFERENCE STANDARDS

- A. Comply with Gypsum Association Documents GA-216 "Recommended Specifications for Application and Finishing of Gypsum Board" and GA-214 "Levels of Gypsum Board Finish", latest editions.
- B. Comply with ASTM Standards referenced within the text of this specification.

1.03 SUBMITTALS

- A. Submit copies of manufacturer's product data and specifications with each material component and accessory plainly identified in accordance with Sections 01 33 00 and 01 33 23.

1.04 QUALITY ASSURANCE

- A. Gypsum board partitions and walls shall be identified in the product data submittal as complying with a fire-rated and listed wall assembly system as classified by Underwriters Laboratories, Inc. (UL) or other accredited independent testing laboratory for required fire-rated construction where indicated on drawings.
- B. Drywall shall not contain elemental sulfur, and shall have no detectable emissions of hydrogen sulfide.

1.05 DELIVERY, STORAGE AND HANDLING

Store materials in a clean, dry area until ready for use. Store gypsum panels in horizontal (flat) position. Steel framing and related accessories shall be stored and handled in accordance with the AISI "Code of Standard Practice".

1.06 PROJECT CONDITIONS

During gypsum panel finishing, maintain temperatures within the building within the range of 55 degrees to 70 degrees F. Provide adequate ventilation to carry off excess moisture.

1.07 SEQUENCING

Where partitions stop against bottom of ceiling grid system, install grid system and floor covering prior to stud erection.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers - Gypsum Board:
1. Georgia-Pacific Corporation
 2. National Gypsum Company
 3. United States Gypsum Company
 4. Pabco Gypsum Co.
 5. Domitar Gypsum Inc.
 6. Eagle Gypsum Products
 7. Louisiana-Pacific Corporation
 8. American Gypsum
 9. or approved substitute
- B. Acceptable Manufacturers - Abuse-Resistant Gypsum Board:
1. United States Gypsum Company
 2. National Gypsum Company
 3. American Gypsum
 4. or approved substitute
- C. Acceptable Manufacturers - Joint Treatment System, Trim, and Accessories:
1. Any acceptable manufacturer listed above
 2. Hamilton Materials, Inc.
 3. Clinch-On Products
 4. Murco Wall Products
 5. or approved substitute
- D. Acceptable Systems and Manufacturers – Acoustical Insulation:
1. Owens Corning
 2. CertainTeed
 3. Johns-Manville
 4. or approved substitute

2.02 GYPSUM BOARD AND RELATED MATERIALS

- A. Gypsum Board: USG Sheetrock Firecode (Type X) 5/8" thick, 48" wide, tapered edge, 1 hour fire-rated boards; or equivalent of other acceptable manufacturer conforming to ASTM C1396.
- B. Drywall Screws: USG Type S or Type S-12 (minimum 1" long) bugle head drywall screws or equivalent of other acceptable manufacturer. Use proper type for gauge of stud or framing. Provide USG Durock steel screw (1-1/4" long) with anti-corrosive coating for cement board applications; or equivalent of other acceptable manufacturer.
- C. Edge Trim: USG Beadex Brand No. B4 paper faced metal L -shaped angle edge trim without back flange; or equivalent of other acceptable manufacturer.
- D. Joint Treatment System: USG Sheetrock Joint Tape, cross-fiber paper reinforcing tape, with USG Sheetrock All Purpose Joint Compound Ready Mixed; or equivalent of other acceptable manufacturer conforming to ASTM C475.
- E. Adhesive: Ohio Sealants, Inc. Formula #38 Adhesive; or equivalent of other acceptable manufacturer.
- F. Control Joints: USG Sheetrock Brand No. 093 roll-formed zinc with tape-protected 1/4" joint opening; or equivalent of other acceptable manufacturer.

- G. Corner Bead: USG Beadex Brand Micro Bead paper faced metal outside corner bead; or equivalent of other acceptable manufacturer.
 - H. Vapor Barrier: 6 Mil thick clear polyethylene sheeting.
- 2.03 WATER-RESISTANT GYPSUM BOARD:
- A. USG Sheetrock Firecode (Type X) "Mold Tough" Water Resistant (W/R) or equivalent of other acceptable manufacturer conforming to the following criteria:
 - 1. 5/8" thick, 48" wide, tapered edge.
 - 2. 1 hour fire-rated boards
 - 3. Conforms to ASTM C1396 and ASTM C473.
- 2.04 ABUSE-RESISTANT / MOLD RESISTANT GYPSUM BOARD
- A. National Gypsum Hi-Abuse Brand XP Fire-Shield gypsum board or equivalent of other acceptable manufacturer conforming to the following criteria:
 - 1. 5/8" thick x 48" wide boards with tapered edges.
 - 2. Boards shall have gypsum core wall panel with additives to enhance fire resistance, surface indentation resistance, and impact resistance of the core and surface.
 - 3. Abrasion / moisture / mold / mildew resistant paper on front, back and long edges.
 - 4. Comply with ASTM C1396, Type X.
 - 5. Surface Abrasion Resistance: Not greater than 0.015" depth when tested at 50 cycles in accordance with ASTM D4977, Modified.
 - 6. Indentation Resistance: Not greater than 0.132" depth when tested at an impact load of 72 in.-lbs. in accordance with ASTM D5420.
 - 7. Impact/Penetration Resistance: Not less than 210 ft.-lbs. when tested in accordance with ASTM E695, Modified.
 - 8. Mold and Mildew Resistance: Panel score of 8, when tested in accordance with ASTM D3273.
- 2.05 ACOUSTICAL INSULATION
- A. Owens Corning Sound Attenuation Batts; or equivalent of other acceptable manufacturer.
 - 1. 3" thickness, unfaced glass fiber acoustical insulation complying with ASTM C665, Type 1.
 - 2. Widths to fit stud spacing.
- 2.06 INTERIOR TILE BASE (CEMENT) BOARD
- A. USG Durock Cement Board or equivalent of other acceptable manufacturer conforming to the following criteria.
 - 1. 1/2" thick, square reinforced edges.
 - 2. Aggregated Portland cement slurry core reinforced with polymer coated glass fiber mesh embedded in both surfaces.
 - 3. 1 hour fire rated boards.
 - 4. Furnish manufacturers recommended joint treatment system.
- 2.10 COMPRESSIBLE GASKETS
- Norton #V-780 1/8" Foam Tape or equivalent of other acceptable manufacturer.

PART 3 - EXECUTION

3.01 MISCELLANEOUS FRAMING AND FURRING

- A. Provide necessary framing and furring for special framing at recesses, specialty items, etc.
- B. Install furring strips over back-up material. Position furring strips 16" on center vertically or horizontally as indicated. Use powder-activated fasteners or stub nails at 24" on center. Shim channels plumb as required.

3.02 INSTALLATION OF GYPSUM BOARD

- A. Apply vapor barrier over face of insulation and beneath gypsum board at exterior framed walls where unfaced batts are utilized. Cover joints of vapor barrier with pressure sensitive tape.
- B. Apply gypsum board panels according to manufacturer's recommendations for fire-resistive construction, if required. Abutting ends and edges of panels shall occur over stud flanges or furring. Joints on opposite sides of partitions shall not occur over the same stud. Install bottom of gypsum board panels 5/8" above concrete floors.
- C. Apply board to studs or furring with drywall screws spaced 12" on center in the field of the board and 8" on center staggered along abutting edges.
- D. Where indicated, apply gypsum board directly to masonry or concrete substrate using adhesive according to manufacturer's instructions.
- E. Apply metal edge trim and corner bead according to manufacturer's recommendations at gypsum board edges that are exposed or abut other materials.
- F. Finish joints, trim, and fastener dimples as recommended by manufacturer of joint treatment system and sand smooth to provide level of finish as follows:
 - 1. "Level 5" finish surface at ceilings and where indicated.
 - 2. "Level 4" finish surface at all other exposed gypsum board partitions and walls.
 - 3. "Level 1" finish surface where concealed.
- G. Install control joints in gypsum board partitions and walls in accordance with referenced Gypsum Association Document GA-216. Runs between control joints shall not exceed 30'-0" on center.

3.03 INSTALLATION OF WATER-RESISTANT GYPSUM BOARD

- A. Install full height water-resistant boards on walls and partitions behind and adjacent to plumbing fixtures, except as otherwise indicated.
 - 1. "Adjacent" is within 2'-0" of fixtures on parallel or perpendicular walls.
 - 2. Install and finish boards in accordance with Article 3.03.
 - 3. Install as backer board behind plate glass mirrors where indicated. Refer to drawing details.

3.04 INSTALLATION OF ABUSE-RESISTANT / IMPACT RESISTANT GYPSUM BOARD

Install boards on walls where indicated in Room Finish Schedule. Install on studs and finish boards in accordance with Article 3.03, and as recommended by manufacturer.

3.05 INSTALLATION OF TILE BASE (CEMENT) BOARD

- A. Provide at all wall tile installations unless otherwise noted.
 - 1. Apply board leaving a 1/8" to 3/16" gap at joints and corners.
 - 2. Screw board to framing at 8" on center in field and 12" on center, within 1/2" of edge, around perimeter.
 - 3. Fill gaps at joints and corners with manufacturer recommended latex Portland cement mortar, and then embed 2" fiberglass mesh tape and smooth material.

3.06 ACOUSTICAL INSULATION

Install at all new gypsum board partitions.

END OF SECTION

SECTION 09 21 10 GYPSUM BOARD CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Gypsum Board Ceilings
- B. Items Installed But Not Furnished Under This Section: Access Doors: Section 08 31 13
- C. Related Sections:
 - 1. Gypsum Board Partitions and Walls: Section 09 21 00
 - 2. Painting: Section 09 91 00

1.02 REFERENCE STANDARDS

- A. Comply with Gypsum Association Documents GA-216 "Recommended Specifications for Application and Finishing of Gypsum Board" and GA-214 "Levels of Gypsum Board Finish", latest editions.
- B. Comply with ASTM Standards referenced within the text of this specification, ASTM C754 for installation of steel framing members and ASTM C840 for the application and finishing of gypsum board.

1.03 SUBMITTALS

- A. Submit copies of manufacturer's product data and specifications with each material component and accessory plainly identified in accordance with Sections 01 33 00 and 01 33 23.

1.04 QUALITY ASSURANCE

Gypsum board ceilings shall be identified in the product data submittal as complying with a fire-rated and listed ceiling assembly system as classified by Underwriters Laboratories, Inc. (UL) or other accredited independent testing laboratory for required 1 hour fire-rated construction.

1.05 DELIVERY, STORAGE AND HANDLING

Store materials in a clean, dry area until ready to use. Store gypsum panels in horizontal (flat) position.

1.06 PROJECT CONDITIONS

During gypsum panel finishing maintain temperatures within the building in the range of 55 degrees to 70 degrees F. Provide adequate ventilation to carry off excess moisture.

PART 2 - PRODUCTS

2.01 GYPSUM BOARD AND ACCESSORIES

- A. Acceptable Manufacturers:
 - 1. United States Gypsum Company
 - 2. National Gypsum Company - Gold Bond
 - 3. American Gypsum
 - 4. Georgia-Pacific Corporation
 - 5. James Hardie Gypsum
 - 6. Pabco Gypsum Co.
 - 7. CertainTeed
 - 8. Temple-Inland Gypsum
 - 9. or approved substitute
- B. Acceptable Manufacturers - Joint Treatment System, Trim, and Accessories:
 - 1. Any acceptable manufacturer listed above

2. Hamilton Materials, Inc.
 3. Clark Dietrich building Systems
 4. Murco Wall Products
 5. or approved substitute
- C. Gypsum Board: USG Sheetrock Firecode (Type X) 5/8" thick, 48" wide, tapered edge, 1 hour fire-rated boards; or equivalent of other acceptable manufacturer conforming to ASTM C1396.
- D. Fasteners: USG Type S bugle head drywall screws (minimum 1" long) or equivalent of other acceptable manufacturer. Provide USG Durock steel screws (1-1/4" long) with anti-corrosive coating; or equivalent of other acceptable manufacturer at cement board applications.
- E. Metal Trim: USG No. 200-B steel L-shaped angle edge trim without back flange; or equivalent of other acceptable manufacturer.
- F. Control Joints: USG No. 093 roll-formed zinc with tape-protected 1/4" joint opening or equivalent of other acceptable manufacturer.
- G. Joint Treatment: USG Sheetrock Joint Tape, cross-fibered paper reinforcing tape, with USG Sheetrock All Purpose Joint Compound Ready Mixed; or equivalent products of other acceptable manufacturer.
- H. Vapor Barrier: 6 mil thick clear polyethylene sheeting.

PART 3 - EXECUTION

3.01 INSTALLATION OF GYPSUM BOARD

- A. Install gypsum board and cement board with long dimension parallel and centered on main tee runners. Fasten board to cross tees with screws spaced at 1-1/2" from side joints and 12" on center within field of board. Screws at end joints shall be spaced 1/2" from end of board. Screws in field shall be staggered on alternating sides of cross tee flanges. Fasten board to wall support angle at 12" on center. Stagger ends of boards minimum of 4'-0".
- B. Finish joints, trim, and fastener dimples as recommended by manufacturer of tape-joint and finishing system and sand smooth to provide "Level 5" finish surface for ceilings.
- C. Control Joints: Install control joints in gypsum board partitions and walls in accordance with referenced Gypsum Association Document GA-216 or as indicated. Runs between control joints shall not exceed 30'-0" on center (50'-0" where ceiling perimeter joint is provided).
- D. Perimeter / Edge Detail: Provide specified metal edge trim and caulk joint all around perimeter of suspended ceiling where it abuts wall of differing material.

END OF SECTION

SECTION 09 30 00 TILE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Ceramic Wall Tile, and Base

- B. Related Sections:
 - 1. Cast in Place Concrete: Section 03 30 00
 - 2. Resilient Flooring: Section 09 65 00

1.02 REFERENCES

Reference Standards: Comply with the following standards:

- 1. Ceramic Tile - Epoxy Thin Set Installation: ANSI A108.6 and A118.3.
- 2. Grout - Material and Installation: ANSI A108.10 and A118.6.
- 3. Tile Council of America - Handbook for Ceramic Tile Installation (current edition).

1.03 SUBMITTALS

- A. Samples: Submit full range of standard color samples of tiles and grouts to Architect for color selection.

- B. Product Data: Submit copies of manufacturer's product data and specifications with each material component and accessory plainly identified in accordance with Section 01 33 00.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver tile in unopened, grade sealed packages. Deliver mortar mixes and grouts in unopened containers. Store all materials in a clean, dry area.

1.06 PROJECT CONDITIONS

Environmental Requirements: Do not install tile when the ambient temperature is below 50 degrees F. Comply with minimum temperature requirements of bonding and grouting materials manufacturers.

PART 2 - PRODUCTS

2.01 TILE MANUFACTURERS

- A. Acceptable Manufacturers - Porcelain Tile:
 - 1. Graniti Fiandre
 - 2. Crossville Ceramics
 - 3. Dal-Tile Corporation
 - 4. Florida Tile
 - 5. Innovative Ceramics, Inc. (ICI)
 - 6. Floor Gres
 - 7. Imola "Top"
 - 8. or approved substitute

- C. Acceptable Manufacturers - Tile Mortar and Grout
 - 1. C-Cure
 - 2. Laticrete
 - 3. Hydroment

4. Mapei
4. or approved substitute

2.02 TILE MATERIALS

- A. Porcelain Wall Tile & Base:
1. 12" x 12" x 3/8" thick nominal size. Crossville Ceramics "Color-Blox EC", or equivalent of other acceptable manufacturer.
 2. 20% pre-consumer recycled content.
 4. Colors: Selected by Architect from full range of manufacturer's available standard colors within Crossville Color Group I and II.
 5. Up to 2 colors may be selected.
- D. Accessory Pieces: Provide bull nose pieces at all outside corners or exposed edges.

2.03 SETTING AND GROUTING MATERIALS

- A. Thin-Set Installation - Base, and Walls:
1. Bond Coat: C-Cure Colorset Epoxy System or equivalent of other acceptable manufacturer.
 2. Grout: C-Cure Colorset Epoxy System or equivalent of other acceptable manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Before proceeding, examine surfaces to receive tile or accessories for defects or conditions adversely affecting quality and execution of the installation. Work shall not proceed until unsatisfactory conditions are corrected. Slabs shall be free of curing compound or other contaminants before proceeding.

3.02 PREPARATION

Surface Preparation: Apply troweled Portland cement plaster leveling coat over interior block walls as required to obtain a smooth level substrate for wall tile and base.

3.03 INSTALLATION

- A. Ceramic Tile Floors - Thin Set Installation: Install, grout, clean, protect, and cure in conformance with referenced ANSI Standards.
- B. Wall Tile and Base - Installation Over Block: Apply a troweled plaster leveling coat over block as required to obtain a level surface. Install wall tile using the dry set method. Install, grout, clean, protect, and cure in conformance with referenced ANSI Standards.
- C. Tile/Joint Lay-Out: Contractor shall schedule with Architect a Pre-Installation Conference to review tile and joint lay-out before proceeding with the installation. Cut tile less than 1/2 tile width will not be allowed.
- F. Crack Isolation Sheet: Install at all thin-set installations, continuous over entire area to be tiled. Set in bond coat material per manufacturer's instructions.

3.03 EXPANSION JOINTS

- A. Location and Sizes: Unless otherwise indicated on drawings, install expansion joints at the following locations:
1. Directly over all expansion or control joints in slab below.
 2. At all intersections of tile with other materials.
 3. Wherever tile abuts vertical surfaces or penetrations.

4. Where tile is installed over existing masonry walls, provide expansion joints corresponding to all existing control or expansion joints in existing masonry wall.
5. Elsewhere as indicated or required by TCA specifications.

B. Review all proposed joint locations with the Architect before proceeding. Locate and size expansion joints as required to prevent damage to tile by expansion and contraction.

C. Installation: Install bond breaker tape, joint filler and sealant as recommended by the manufacturer and TCA specifications. Clean and prime joints as recommended by the sealant manufacturer. Fill joints to recommended depth and apply anti-tack agent where necessary. Protect freshly applied sealant from traffic and dirt. Fill joints to slightly below surface and do not carry over to adjacent materials.

3.05 CLEANING

Remove colored grout immediately to prevent staining of tile. Clean tile using methods recommended by the manufacturer.

3.05 SEALING

Tile sealer is not required.

END OF SECTION

SECTION 09 65 00 RESILIENT FLOORING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Vinyl Composition Tile
 2. Luxury Vinyl Composition Tile
 3. Slip Resistant Sheet Flooring
 4. Rubber Base
 5. Vinyl Edging
 6. Adhesive
- B. Related Sections:
1. Cast-in-Place Concrete: Section 03 30 00
 2. Carpeting: Section 09 68 00
 3. Floor Mats and Frames: Section 12 48 13

1.02 SUBMITTALS

- A. Samples: Submit to the Architect a full set of resilient flooring samples scheduled to be used for the project. Samples shall be complete and up to date. Colors will not be selected until all samples are received by the Architect.
- B. Contract Closeout Submittals: Submit in accordance with Section 01 77 00. Submit specified warranties and manufacturer's maintenance instructions for each type of resilient flooring specified. Include recommended cleaning methods, materials, and frequency.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in unopened containers and store protected in accordance with the manufacturer's directions and recommendations. Unless otherwise directed, store materials in original containers at not less than 70 degrees F. for not less than 24 hours immediately before installation.

1.04 PROJECT CONDITIONS

- A. Maintain temperature in space to receive resilient flooring between 70 degrees F. and 90 degrees F. for not less than 24 hours before and 48 hours after installation. Following 48 hour period, maintain minimum temperature of 55 degrees F. until completion of project.
- B. Verification of Conditions: Examine and test substrate for excessive moisture content (using Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride - ASTM F1869) and unevenness which would prevent execution and quality of flooring installation as specified. Submit copies of moisture test results conducted on concrete floor slabs to Architect.

1.05 WARRANTY

- A. Resilient flooring installer shall provide a written statement, in accordance with Section 01 77 00, that the installation is warranted for one (1) year and that he will, upon demand, repair or replace any resilient flooring that does not adhere properly and will correct any condition due to faulty installation during the warranty period. The warranty period shall commence at the Date of Substantial Completion.

- B. Provide one (1) year warranty from each flooring product manufacturer, commencing from the Date of Substantial Completion, agreeing to repair or replace the resilient flooring systems used on the project (including finish materials and adhesives) if system fails to perform (i.e., loss of adhesion, cupping, cracking, separation of joints, displacement, etc.) due to failure of materials, including without limitation, failure of adhesives.
- C. Using the Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride (ASTM F1869) the adhesives shall be warranted against failure when used on a substrate exhibiting the following maximum moisture contents.
 - 1. Up to and including 7.0 lbs. per 1,000 S.F. in a 24 hour period for vinyl composition and rubber tile when tested at any time during the warranty period.
 - 2. Up to and including 5.0 lbs. per 1,000 S.F. in a 24 hour period for sheet vinyl flooring when tested at any time during the warranty period.

1.06 MAINTENANCE

- A. Extra Materials: Provide the Owner, at the completion of the project, the following items:
 - 1. Resilient flooring in the amount of 1% of each color and type used.
 - 2. One case of rubber base of each color and type used
 - 3. One gallon of each type of adhesive used

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers - Vinyl Composition Tile:
 - 1. Armstrong
 - 2. Tarkett
 - 3. Mannington
 - 4. or approved substitute
- B. MANUFACTURERS
Acceptable Manufacturers – Luxury Vinyl Tile Planks:
 - 1. Mannington
 - 2. or approved substitute
- C. Slip Resistant Sheet Flooring
Acceptable Manufacturers – Slip Resistant Flooring
 - 1. Mannington
 - 2. or approved substitute
- B. Acceptable Manufacturers - Rubber Base and Vinyl Edging:
 - 1. Azrock Floor Products
 - 2. Nora Rubber Flooring
 - 3. Johnsonite
 - 4. R.C. Musson Rubber Company
 - 5. Roppe Rubber Corporation
 - 6. Burke Industries
 - 7. Armstrong
 - 8. or approved substitute

2.02 VINYL COMPOSITION TILE

- A. Armstrong Standard Excelon, Imperial Texture Multicolor or equivalent of other acceptable manufacturer.
 - 1. 12" x 12" x 1/8"

2. Architect shall have option to select from the full range of colors. Up to four (4) colors may be selected by Architect for use in different rooms or to create floor patterns (floor pattern to have 50% field color and 50% divided between up to three (3) other colors).
3. Floor patterns will be furnished by Architect at time of color selections.

2.03 LUXURY VINYL TILE PLANKS

- A. Mannington Nature's Path 4" x 36" planks with micro bevel edges.
 1. 2.5mm (.100") thick.
 2. One color will be selected by Architect from manufacturer's standard colors.

2.04 SLIP RESISTANT SHEET FLOORING

- A. Mannington Assurance II or equivalent of other acceptable manufacturer.
 1. 0.080 inch thick.
 2. 72" roll.
 3. Up to two colors selected by Architect from manufacturer's standard colors.

2.05 RUBBER BASE

- A. 1/8" thick rubber base, 4" high (6" high at toilets where rubber base is scheduled).
 1. Provide base with top and toe cove at resilient flooring; provide top cove straight base at carpeting.
 2. Factory-formed external and internal corners are not allowed. Use rolled-goods wherever possible.
 3. Up to three (3) colors may be selected by Architect.

2.06 VINYL EDGING

Furnish vinyl edging 1" wide, 1/8" thick, at all exposed edges of resilient flooring and / or carpeting. Profile and up to three (3) colors as selected by Architect.

2.07 MOISTURE VAPOR CONTROL - CONCRETE SLAB-ON-GRADE SEALER:

At new concrete slabs and concrete slab patches. , reference Concrete Slab-on-Grade Vapor and Alkalinity Control System as specified in Section 03 39 00.

2.08 ADHESIVE

- A. Provide adhesives required by the manufacturer of the material being installed to achieve specified warranty requirements. Adhesive for vinyl edging and base shall be a type not affected by heat. Clear spread adhesives are not permitted.

2.09 LATEX UNDERLAYMENT COMPOUND

As approved by resilient floor manufacturer, compatible with adhesive to be used for installation of flooring materials.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Do not proceed with installation or resilient flooring until unacceptable conditions have been corrected. Commencement of flooring installation by the Contractor indicates acceptance of the moisture content and finish of the concrete floor.

3.02 PREPARATION

- A. Surface Preparation:
 1. Level uneven concrete floor joints or other irregularities by filling with latex underlayment compound.
 2. Sand leveled areas to provide a completely level surface. Any required grinding or chipping of concrete will be at the expense of the Contractor.

3. Thoroughly clean concrete floors before applying floor coverings.
 4. Remove rough spots and any foreign matter that might be evident through the floor covering.
 5. Prime concrete floors as recommended by the manufacturer of the flooring material.
- B. Verify compatibility of the floor covering mastic with previously applied curing compound, if any.
- 3.03 APPLICATION OF CONCRETE SEALER
- A. Concrete Slab-on-Grade: Apply to concrete floor slabs only if tests show moisture in excess of specified standards, and if application of sealer is approved by flooring manufacturer. Concrete sealing will be paid for by Owner on a time and material basis by Change Order, provided Owner has approved this measure before proceeding.
 - B. Sealer Application: Method and quantity of sealer application shall be in strict accordance with concrete sealer manufacturer's instructions.
- 3.04 APPLICATION OF ADHESIVES
- A. Mix and apply adhesives in accordance with manufacturer's instructions. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer. Apply uniformly over surfaces.
 - B. Cover only that amount of area that can be covered by flooring material within the recommended working time of the adhesive.
 - C. Remove any adhesive that dries or films over. Do not soil walls, bases, or adjacent areas with adhesives. Promptly remove any spillage.
 - D. Apply adhesives with notched trowel or other suitable tool. Clean trowel and rework notches as necessary to ensure proper application of adhesive.
- 3.05 INSTALLATION
- A. Complete installation of resilient flooring in strict accordance with the recommendations and specifications of the manufacturer. Make joints straight, tight and flush. Tightly cement to floor.
 - B. Coordinate layout of each floor area between walls so cuts on opposite sides of the area are of equal width. Where tile with a directional pattern is used, all tiles shall run in same direction in a given room. Confer with Architect for direction of tile. Turn VCT 1/4 turn. Architect will furnish layout of multi-color floor patterns following color selections.
 - C. Sheet flooring seams shall be heat welding in accordance with manufacturer's recommendations using approved heat-welding thread and techniques. Roll sheet flooring with 100 pound roller to ensure proper bonding.
 - D. Complete installation of sheet vinyl flooring in strict accordance with the recommendations and specifications of the manufacturer.
 - E. Rubber base shall be tightly cemented to wall with butt joints 1/16" or less in width. Install base in toe space of cabinets. Install continuously around outside and inside corners with joints a minimum of 24" away from corners on both sides. Preformed corners are not allowed.

- F. Install vinyl edging at exposed edges of carpet and resilient flooring surfaces, and at transitions between carpet and resilient flooring. Install edging directly under doors where differing floor materials meet.

3.06 CLEANING

- A. Upon completion, remove loose, cracked, chipped, stained, or otherwise defective resilient flooring or base and replace in a satisfactory manner. Clean surfaces using only cleaners approved by the flooring product manufacturer. Remove mastic cement from adjoining work with particular care to not damage such work.
- B. Allow a minimum of seven (7) days for resilient flooring to adhere tightly before dry mopping and buffing.

3.07 PROTECTION

- A. Protect finished work from damage by subsequent construction operations. Where possible, lock rooms following cleaning of flooring.

END OF SECTION

SECTION 09 68 00 CARPETING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Carpet
 2. Carpet Accessories and Adhesive
 3. Sealing Concrete Floor Slabs-on-Grade

1.02 SYSTEM DESCRIPTION

Performance Requirements: Carpeting shall meet the minimum requirements of the following Flame Retardant Tests. Test results shall be provided for each type carpeting provided.

Flame Resistance (Pill Test):	Passes (CPSC FF-1-70 - ASTM D2859)
Smoke Density:	Less than 450 (ASTM E662)
Flooring Radiant Panel:	Class 1 (ASTM E648)

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's written recommended installation procedures for each type of carpet. Include product data of manufacturer recommended adhesives.
- B. Seaming Diagram: Submit proposed carpet layout indicating all seams.
- C. Samples: Submit three 12" x 12" size samples of color indicated in Article 2.01.
- D. Quality Control Submittals: Submit test results in accordance with Articles 1.02 and 3.01.
- E. Contract Closeout Submittals:
1. Maintenance Data: Submit carpet manufacturer's recommended maintenance program written specifically for this project in accordance with Section 01700.
 2. Warranty: Submit manufacturer and installation warranties specified in Article 1.07.

1.04 QUALITY ASSURANCE

- A. Carpet installer must have a minimum of five (5) years experience on installations of similar size and complexity. The installation crew must be fully qualified to install the type of carpet to be furnished.

1.05 DELIVERY, STORAGE AND HANDLING

Deliver carpet in original mill wrapping or cartons with each roll or carton having register number tags attached or register number stenciled on bale and intact. Store under cover in well-ventilated spaces as soon as delivered. Protect from damage, dirt, stains, and moisture. Protect adhesive and accessories in original unopened containers. Protect adhesives from freezing.

1.06 PROJECT CONDITIONS

- A. Existing Conditions: Carefully check dimensions and other conditions and be responsible for proper fitting of carpet in areas designated.
- B. Consider moisture conditions of substrate to determine whether proposed adhesive will supply proper bond between floor and carpet backing.

1.07 WARRANTY

Provide manufacturer's standard carpet material warranty. Installer shall warranty covering the installation for one (1) year and that installer will, upon demand, repair or replace any carpet that does not adhere properly and will correct any condition due to faulty installation during the warranty period. The warranty period shall commence at the Date of Substantial Completion.

1.08 MAINTENANCE

A. Carpet:

1. Furnish Owner with all usable scrap. Usable scrap is defined as any scrap piece over 2 sq. ft. in area and wider than 8".
2. Furnish Owner with 6% overrun of each color and type used. Overrun is defined as continuous, full-width rolled goods.

B. Adhesive: Furnish Owner with one (1) extra gallon of each type of carpet adhesive used.

1.09 SEQUENCING

Where partitions stop against bottom of ceiling grid system, install grid system and carpeting prior to stud erection.

PART 2 - PRODUCTS

2.01 CARPET TYPE 1 (CPT-1)

A. Acceptable Carpet: Collins & Aikman "In Stitches", or Mannington "Halftime, Gametime II" or "Proof" or equivalent of other approved manufacturer.

1. 6' or 12' Roll Goods
2. Collins & Aikman Powerbond recycled content vinyl MK-1 RS Backing or Mannington Integra HP
3. A maximum of one (1) standard color may be selected.

2.02 ADHESIVES AND SEAMING

Adhesive recommended by carpet manufacturer capable of withstanding five (5) pounds of moisture emanating from concrete slab per thousand square feet area during a 24-hour period. Provide manufacturer's recommended seam treatment for chemically welded seams.

2.03 VINYL EDGING AND RUBBER BASE

As specified in Section 09 65 00.

2.04 LATEX UNDERLAYMENT COMPOUND

As approved by carpet manufacturer, compatible with adhesive to be used for installation of carpet.

2.05 MOISTURE VAPOR CONTROL:

A. At New Concrete Slabs:

1. At all new concrete slabs, reference Concrete Slab-on-Grade Vapor and Alkalinity Control System as specified in Section 03 39 00.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine substrate for excessive moisture content and unevenness which would prevent execution and quality of carpet installation as specified. Submit copies of moisture test results conducted on concrete floor slabs to Architect.

B. Do not proceed with installation of carpet until defects have been corrected.

3.02 PREPARATION

- A. Level uneven floor joints or other irregularities in substrate by filling with latex underlayment compound. Sand leveled areas to provide a completely level surface. Any required grinding or chipping of concrete shall be at the expense of the Contractor. Remove rough spots and foreign matter which may be evident through the carpet.
- B. Thoroughly clean and damp mop concrete floor slabs and allow to dry before applying adhesive.

3.03 APPLICATION OF CONCRETE SEALER

- A. Sealer Application: Method and quantity of sealer application shall be in strict accordance with concrete sealer manufacturer's instructions.

3.04 INSTALLATION

- A. Lay out carpeting in manner to minimize seams in high traffic areas. The carpet shall be laid out such that the pile direction and seam orientation is consistent throughout the project.
- B. Follow recommended procedures for installation furnished by the manufacturer. Carpet material for this project shall be adhered directly to the floor. Unsatisfactory installation resulting from work performed shall be rejected and shall result in the removal and reinstallation of carpet at the expense of the installer. Particular attention should be paid to manufacturer's recommendations for application of adhesives, seaming, and cross jointings.
- C. Remove adhesives and seam cement from the face of the carpet immediately.
- D. Apply adhesive over the entire field area for direct glue down carpet. Random application is not acceptable.

3.05 CLEANING

- A. After installation is complete, clean up dirt and debris, remove spots, and clean carpet with cleaning agents recommended by the manufacturer. Remove loose threads with sharp scissors. Clean carpet with vacuum cleaner.
- B. Remove rubbish, wrapping paper, and salvages from the job site. Leave excess pieces of usable carpet with the Owner for future use.

3.06 PROTECTION

Following cleaning of carpet, completely cover carpet with heavy protective paper or polyethylene sheeting. Leave protective covering in place until work in area is completed and permission for removal is granted by Architect.

END OF SECTION

SECTION 09 91 00 PAINTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Exterior surfaces of metal not specifically excluded shall be painted. Interior surfaces not specifically excluded shall be painted or natural finished. Refer to Room Finish Schedule.
- B. Work Not Requiring Painting or Finishing: In addition to material obviously not requiring paint such as glass, flooring, etc., the following surfaces shall not be painted:
 - 1. Surfaces indicated by the finish schedule to remain unfinished
 - 2. Factory finished surfaces except those indicated in Article 3.07
- C. Related Sections:
 - 1. Metal Fabrications: Section 05 50 00
 - 2. Finish Carpentry: Section 06 20 00
 - 3. Graffiti Control Coatings: Section 09 96 23
 - 4. Steel Doors and Frames: Section 08 11 13
 - 5. Prefinished Wood Doors: Section 08 14 29
 - 6. Access Doors: Section 08 31 13
 - 7. Fire Extinguisher, Cabinets, and Accessories: Section 10 44 00
 - 8. Piping Identification: Division 23

1.02 SUBMITTALS

- A. Samples: Make paint and stain samples as requested by the Architect. Remake samples as necessary until all color samples are approved. Approval is for color only.
- B. Color Schedule: The Architect will provide a color schedule in four (4) copies to the Contractor listing paint colors selected. (Paint color selections will be made in conjunction/ coordination with all other color selections required for the project.) Color selections will be made by the Architect from color systems of Sherwin-Williams or Kwal-Howells. If materials of other manufacturers are used, colors must match selected colors and samples will be required by the Architect. Paint color selections will refer to base coats only and may be subject to minor alterations prior to application of final coat; no final coat shall be applied until authorized by the Architect.

Contractor shall not purchase paint for final coat until colors are approved by the Architect.

- C. Quality Control Submittals:
 - 1. Submit a letter to the Architect listing the brand, quality and technical specification of each different material intended for use on the project. Materials shall be cross referenced to coating systems specified in Articles 3.04 and 3.05. Materials shall be approved by the Architect before ordering.
 - 2. Submittal letter must specifically address the product compliance with Green Seal Standard GS-11 for interior paints and coatings. Refer to Article 2.01, Paragraph A, 3 for additional information.
- D. Closeout Submittals:

Furnish coating maintenance instructions including care and cleaning instructions and touchup procedures.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials required for painting in unbroken packages bearing the brand and name of manufacturer. Order materials sufficiently in advance to be on the job when needed and deliver at the building in sufficient quantities so the work will not be delayed. No claim by the Contractor

concerning unsuitability of any material specified or his inability to produce first-class work with the same, will be entertained.

- B. Storage and Mixing: A room or space will be assigned in which to mix or store painting materials. No empty containers of any sort or description bearing the name or brand of any manufacturer shall be brought upon the premises for mixing of paint unless labels are canceled and containers are closely marked as to contents. The paint storage area shall be open for periodic observation by the Architect to verify only approved materials are being used.

1.04 PROJECT CONDITIONS

- A. Environmental Requirements: Do not apply exterior paint in extreme cold, frosty, foggy, or damp weather. Paint only when the exterior temperature is 50 degrees F. or higher. Ensure that all surfaces to be painted are absolutely dry. In no case will exterior painting be allowed while dust is blowing.
- B. Existing Conditions: Spaces must be clean before interior painting is started. Do not paint in rooms or spaces where rubbish has accumulated or while rubbish is being removed. Painting shall not be allowed in dusty rooms. Do not remove rubbish while finish is fresh. Surfaces to which finish is to be applied shall be dry and clean. The space in which paint is being applied must be maintained at a constant temperature and humidity, as required by the manufacturer of the product being utilized.

1.05 MAINTENANCE

At the completion of project, turn over to the Owner one (1) full gallon of each paint and stain color and type used, along with the color number or formula for each type. Epoxy and high performance coatings are not included to be turned over to the Owner, however, submit color number or formula of paint color and type.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Products not specified by name shall be of manufacturers named in Paragraph B listed below and meet standards required for LEED Certification, refer to item 3 below.
 - 2. Provide primers and undercoat paint produced by the same manufacturer of the finish coats.
- B. Acceptable Manufacturers: The following manufacturers will be acceptable for use on the work:
 - 1. For Paint, Stain, and Varnish:
 - Sherwin-Williams
 - Kwal Paint Co.
 - Pittsburgh (PPG)
 - PPG - Glidden Professional Paints
 - Benjamin Moore
 - AFM Safecoat
 - Kelly-Moore Paint Co.
 - 2. Epoxy Coating:
 - Sherwin-Williams
 - Kwal Paint Co.
 - Tnemec
 - Pittsburgh (PPG)
 - PPG - Glidden Professional Paints
 - Diamond Vogel
 - Ameron International

3. High Performance Coating (exterior):
Tnemec
Ameron International
Sherwin-Williams
PPG - Glidden Professional Paints

PART 3 - EXECUTION

3.01 EXAMINATION

Examine surfaces scheduled to receive paint and finishes for conditions that will adversely affect execution, permanence, or quality of work. Surfaces shall be put into an acceptable condition through preparatory work as specified in Article 3.02. Do not proceed with surface preparation or coating application until conditions are suitable.

3.02 PREPARATION

- A. Protection: Furnish and lay drop cloths or mask off areas where painting is being done to protect floors and adjacent work from damage during painting and finish operation. Where it becomes necessary to remove temporary coverings placed by other trades, replace same in proper manner. Remove soiled rags and waste from the building every night. Do not allow to accumulate.
 1. Be responsible for damage caused by painting to work of other trades, repairing same to the satisfaction of the Architect. Replace materials damaged to such an extent that they cannot be restored to their original condition.
- B. Surface Preparation:
 1. General: Sand finishes on wood and metal surfaces between coats to assure smoothness and adhesion of subsequent coats. Use extra fine sandpaper to avoid cutting the edges when sanding. Apply putty or spackling compound after surfaces are primed and primer is dry. Bring filler material flush with adjoining surfaces. Surfaces shall be dry, clean and smooth before starting work. Fill cracks, holes or checks full and make smooth before finish is applied to surfaces. Fill cracks that occur after walls are sized.
 2. Interior Wood Surfaces to be Painted: Touch-up sap and knots with an approved sealer or primer. Fill voids with putty after primer is dry.
 3. Interior Ferrous Metal: Remove foreign material from unprimed metal with wire brush and dust clean.
 4. Shop Primed Metals: Touch-up shop primed metals with material similar to the original shop-applied primer. Sand and dust primer on hollow metal work before finish painting to remove grease and dirt film from surfaces. Shop primer must be compatible with finish coats described herein.
 5. Interior and Exterior Zinc Coated Metal (galvanized surfaces): Wash with lacquer thinner and prime as specified.
 6. Interior Wood to be Clear Finished: Sand as required. Fill voids and nail holes after first coat is dry using a filler compatible with the finish system and matching color.
 7. Exterior Ferrous Metal: Remove foreign material from unprimed metal with wire brush and dust clean.
 8. At all other surfaces not covered in the items listed above, make all necessary surface preparation, testing, and sample preparation to insure successful coverage and performance.

3.03 WORKMANSHIP

- A. Substrate Surface: The application of the first coat by Contractor does not relieve him of the responsibility for the base. If the surfaces are not in proper shape for painting; repair, rebuild, or refinish before proceeding with the work. Do not apply coats on damp or wet surfaces. Contractor will be held responsible for poor work caused by improper surface finish or condition.

- B. Application: Spread materials evenly without runs, excessive brush marks, or sagging of materials.
- C, Roller Application: Where paint is rolled on, use a fine nap roller so a nearly flat or orange peel texture is obtained.

3.04 **COATING SYSTEM - INTERIOR**

The products specified for each of the following systems are manufactured by Sherwin-Williams (unless otherwise noted). Products of other acceptable manufacturers listed under Article 2.01, Paragraph B, may be utilized if they match or exceed the Technical Specification of the listed product, satisfy the requirements of LEED Certification, and gain the approval of the Architect.

A. **Woodwork - Painted:**

- First coat ProMar 200 Zero VOC Primer, 0g/L VOC
- Second coat Latex Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC
- Third coat Latex Enamel Semi-Gloss, Pro Industrial Acrylic B66-650 Series, 0 g/L VOC

B. **Woodwork - Stained:**

- First coat Transparent wood stain, Wood Classics, A49W800 Series, 250 g/L VOC
- Second coat Clear finish, Wood Classics WB Polyurethane A68, <350 g/L VOC
- Third coat Clear finish, Wood Classics WB Polyurethane A68, <350 g/L VOC

C. **Ferrous, Zinc Coated or Factory-Primed Metals - Painted:**

- First coat Pro Industrial Pro-Cryl Universal Primer B66-310 Series, <100 g/L VOC (prepare zinc coated metal as recommended by manufacturer).
- Second coat Latex Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC
- Third coat Latex Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC

D. **Hollow Metal Frames and Doors - Painted:**

- First coat Factory-prime coat (sanded), touch-up repairs, scrapes, or any bare metal with Pro Industrial Pro-Cryl Universal Primer B66-310 Series <100 g/L VOC
- Second coat Latex Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC
- Third coat Latex Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC

E. **Block and Concrete- Painted:**

- First coat Block Surfacer, Loxon Block Surfacer, <100 g/L
- Second coat Latex, Eggshell, Pro-Mar 200 Zero VOC, B26-2600 Series, 0 g/L VOC
- Third coat Latex, Eggshell, Pro-Mar 200 Zero VOC, B26-2600 Series, 0 g/L VOC

F. **Gypsum Board - Painted:**

- First coat Suitable latex primer, ProMar 700 Primer/Finish, <50 g/L VOC
- Second coat Latex, Eggshell, Pro-Mar 200 Zero VOC, B26-2600 Series, 0 g/L VOC

Third coat Latex, Eggshell, Pro-Mar 200 Zero VOC,
B26-2600 Series, 0 g/L VOC

G. **Concrete and Gypsum Board - Epoxy:**

First coat ProMar 200 Zero VOC Interior Latex Primer, B28W2600,
0 g/L VOC

Second coat Epoxy Coating, Semi-Gloss, Pro Industrial Pre-Catalyzed Water
Based Epoxy, K46 Series, <150 g/L VOC

Third coat Epoxy Coating, Semi-Gloss, Pro Industrial Pre-Catalyzed Water
Based Epoxy, K46 Series, <150 g/L VOC

Painting Subcontractor shall meet with the Architect's Field Representative before application to review application technique and desired finish. Surface shall be smooth as possible, all pin-holes must be filled before applying epoxy paint.

3.05 COATING SYSTEM - EXTERIOR

The products specified for each of the following systems are manufactured by Sherwin-Williams (unless otherwise noted). Products of other acceptable manufacturers listed under Article 2.01, Paragraph B, may be utilized if they match or exceed the Technical Specification of the listed product and gain the approval of the Architect. Primer may be omitted when refinishing existing surfaces.

A. **Ferrous Metals - Painted:**

First coat Suitable Primer (or factory prime coat), Pro Industrial Pro-Cryl
Universal Primer B66-310 Series <100 g/L VOC

Second coat Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-
650 Series, 0 g/L VOC

Third coat Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-
650 Series, 0 g/L VOC

B. **Exposed Exterior Metal Fabrications, Metal Doors, Hollow Metal Door Frames - High Performance Coating:**

Prime coat Suitable prime coat, Tnemec Series 161-1255 (prepare zinc
coated metal as recommended by manufacturer).

Or MacroPoxy 646-100 (prepare zinc coated metal as
recommended by manufacturer).

Top coat Tnemec Series 1075U EnduraShield II (Spray Applied) 4.0 Dry
Film Thickness (Total dry film thickness, prime plus top coat,
not less than 8.0 mils).

Or Water-Based Acrolon 100 Polyurethane Gloss, B65-700
Series. (Spray Applied) 4.0 Dry Film Thickness (Total dry film
thickness, prime plus top coat, not less than 8.0 mils).

Prime coat and top coat application shall include interior faces of exterior hollow metal frames and doors. Confirm compatibility of factory primer used on exposed exterior structural steel and metal fabrications with system prime coat.

C. **Other Zinc Coated Metal (Galvanized) - Painted:**

First coat Galvanized Iron Primer,), Pro Industrial Pro-Cryl Universal
Metal Primer B66-310 Series <100 g/L VOC

(prepare zinc coated metal as recommended by manufacturer).

Second coat Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-
650 Series, 0 g/L VOC

Third coat Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-
650 Series, 0 g/L VOC

D. Aluminum - Painted:

First coat	Galvanized Iron Primer, Pro Industrial Pro-Cryl Universal Metal Primer B66-310 Series <100 g/L VOC
Second coat	Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC
Third coat	Exterior 100% Acrylic, Semi-Gloss, Pro Industrial Acrylic, B66-650 Series, 0 g/L VOC

F. Wood Painted:

First coat @ Field Cut Edges	Exterior Latex Wood Primer, B42W8041 Series
Second coat	Exterior Latex Acrylic, Satin A-100 Exterior Latex A82 Series
Third coat	Exterior Latex Acrylic, Satin A-100 Exterior Latex A82 Series

G. Factory Primed Cement Board Siding & Trim Painted:

First coat	Exterior Latex Wood Primer, B42W8041 Series
Second coat	Exterior Latex Acrylic, Satin A-100 Exterior Latex A82 Series
Third coat	Exterior Latex Acrylic, Satin A-100 Exterior Latex A82 Series

3.06 MISCELLANEOUS REQUIREMENTS

- A. Mechanical Piping and Ductwork: Wherever exposed insulated pipe or ductwork occurs in rooms where walls or ceilings are finished, cover insulation jacket with one coat sealer and two coats flat paint.
1. Wherever exposed uninsulated piping or ductwork occurs in rooms where walls or ceilings are finished, piping or ductwork shall be painted as called for under ferrous, zinc coated, or factory-primed metals. Identification markings will be applied by mechanical subcontractor under Division 23.
- B. Grilles, Registers and Louvers: Grilles, registers, and louvers shall be painted, colors as selected by Architect, thoroughly covering surfaces that are visible after installation. After installation, touch up screws and scuffed spots or repaint as required to achieve a uniform paint job.
- D. Objects on Roof: Paint metal objects on the roof including, but not limited to, new & existing flashings, roof drains, vents, exhaust fans, air intake hoods, etc., as specified under ferrous, zinc-coated metals, and aluminum. Mask off coils and nameplates on rooftop mounted mechanical units.
- E. Prime Coated Hardware: Paint removable mullions and prime coated hardware as specified under ferrous, zinc coated, or factory-primed metals - painted.
- F. Job Finished Woodwork: Spread finish evenly and thoroughly brush out. Sand work between coats with 150 grit or finer sandpaper. Finish the upper and lower edges of job-finished wood doors the same as the face. This work shall be done after doors have been fitted and are ready for final hanging.
- G. Electrical Wiremold, Plugmold, and Exposed Conduit: Paint to match surface on which installed.
- H. Colors Accent: The Architect may select accent colors (contrasting bright colors) for interior painted walls or ceilings. Where accent colors are selected, apply extra coats of paint required to obtain a completely opaque surface. Make allowance for this requirement in base bid. Additional labor or materials used for this purpose will not be allowable as an extra cost.
- J. Sanding: Lightly sand work between coats with 150 grit or finer sandpaper (as recommended by manufacturer) where multiple coats of gloss finish are applied.

3.08 CASEWORK, SHELVING AND TRIM

Finish exterior and interior of casework, shelving, and trim, except those with factory finish, as indicated on drawings or to match adjoining work. Hardwood shall be stained and finished; other wood trim shall be painted using materials and number of coats indicated under Article 3.04.

3.09 CLEANING

At the completion of work, remove surplus materials, staging, and rubbish. Clean paint, clear finish, and stains from floors, glass, walls, and hardware. Leave the premises in clean condition.

END OF SECTION

Not for Construction

SECTION 09 91 00 ANTI-GRAFFITI COATINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
1. Graffiti Coating on Exterior Brick Surfaces.

1.02 SUBMITTALS

- A. Product Data: Submit product data with complete installation instructions in accordance with Sections 01 33 00 and 01 33 23.
- B. Product Data: Manufacturer's specifications and technical data including the following:
1. Detailed specification of construction and fabrication.
 2. Manufacturer's installation instructions.
 3. Certified test reports indicating compliance with performance requirements specified herein.
- C. Quality Control Submittals:
1. Statement of qualifications: Applicator shall be certified by manufacturer to apply coatings.
 2. Statement of compliance with Regulatory Requirements.
 3. Field Quality Control Submittals as specified in Part 3.
 4. Manufacturer's field reports.
- C. Contract Closeout Submittals: Submit maintenance manuals in accordance with Section 01770, include full instructions for removing graffiti and restoring graffiti control coating.
- D. Warranty: Submit in accordance with Article 1.07.

1.03 QUALITY ASSURANCE

- A. Manufacturer's Qualification: Not less than 5 years experience in the actual production of specified products.
- B. Installer's Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, plus the following:
1. Acceptable to or licensed by manufacturer.
 2. Not less than 3 years experience with systems.
 3. Successfully completed not less than 5 comparable scale projects using this system.
- C. Product Qualifications:
1. The anti-graffiti coating shall meet the following requirements:
 - a. Active Content: Fluorosilane.
 - b. Solvent: None, water-bourne.
 - c. Cleaning Cycles: Non-sacrificial, minimum 8 to 10 cleaning cycles without reapplication.
 - d. Breathability: Greater than 95% water vapor transmission.
 - e. Surface Appearance: No appreciable difference compared to non-coated surface.
 - f. Excellent Ultraviolet light stability.
- D. Regulatory Requirements: Products shall comply with State and local regulations concerning AIM (Architectural, Industrial and Maintenance) coatings regarding Volatile Organic Content (VOC). Silicone and Siloxane based materials are unacceptable

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver products in original unopened packaging with legible manufacturer's identification.
- B. Storage and Protection: Comply with manufacturer's recommendations.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Maintain ambient temperature above 40 degrees F during and 24 hours after installation.
 - 2. Do not proceed with application on materials if ice or frost is covering the substrate.
 - 3. Do not proceed with application if ambient temperature of surface exceeds 100 degree F.
 - 4. Do not proceed with the application of materials in rainy conditions or if heavy rain is anticipated with 4 hours after application.
- B. Coating Coordination:
 - 1. Verify compatibility with curing compounds, patching materials, repair mortar, paints, sealants, water repellent coatings, etc. to be used on masonry surfaces to ensure compatibility with the anti-graffiti coating..

1.07 WARRANTY

- A. Submit a written warranty in accordance with Section 01 77 00, executed by the Applicator and Coating Manufacturer covering materials and labor, agreeing to repair or replace materials that fail to provide graffiti protection within the specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.
 - 2. All defective areas shall be retreated by the system manufacture as determined by the Architect. The required written warranty shall be provided by the system manufacturer.
 - 3. The Anit-Graffiti manufacturer shall be responsible for providing labor and materials to reseal areas where coating effectiveness does not meet the specified limits.

1.08 MAINTENANCE

Extra Materials: Provide the Owner, at the completion of the project, the following items:

- 1. One (1) gallon of anti-graffiti coating.

PART 2 - PRODUCTS

2.01 ANTI-GRAFFITI COATING

- A. Acceptable Manufacturers and Products:
 - 1. Protectosil Anti-Graffiti, (Evonik Degussa A&S Division, Bob Cuje 303-779-0321).
 - 2. or approved substitute

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine masonry surfaces following cleaning to assure conditions are satisfactory for application. Surfaces to be coated shall be clean, free of efflorescence, and dry.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Protection: Install coverings to protect adjacent surfaces.
- B. Surface Preparation:
 - 1. Surfaces to receive sealer shall be cleaned of dirt, oil, graffiti, grease, laitance, and other contaminants.

2. Remove dirt, dust and materials that will interfere with the proper and effective application of the anti-graffiti coating. It is the responsibility of the Contractor to prepare the surfaces of the concrete as recommended by the Anti-graffiti Manufacturer.
3. Check the compatibility of all caulking and patching material to be used with the anti-graffiti coating.
4. Sealants, patching materials, expansion joints, and water repellent coatings shall have been installed and approved by anti-graffiti coating manufacturer.

3.03 FIELD QUALITY CONTROL

A. Test Area:

1. Before anti-graffiti coating application the following field evaluation shall be performed. The cost of the field testing shall be the responsibility of the Anti-Graffiti Manufacturer.
2. Prepare a three feet by three feet area to be sprayed with the anti-graffiti coating. The area will be determined by the Architect and Owner.

B. Manufacturer's Field Services:

1. Furnish written certification that surface preparation method, and final condition has manufacturer's approval, and conditions comply with the warranty. Submit this certification prior to beginning application of water repellent product.
2. Test area: Furnish results of test area absorption on each type of substrate. Test results shall determine application rate.
3. Work shall be supervised by an authorized manufacturer's representative who shall be on the job site during application and shall certify application procedures including:
 1. Coverage rate.
 2. Temperature and Site Conditions.
 3. Conformance with manufacturer's recommendations.

3.04 APPLICATION

A. Wait until masonry is clean and dry before application of anti-graffiti coating.

B. Products shall be applied as supplied by the manufacturer without dilution or alteration. Apply at coverage rate and number of coats as recommended by the manufacturer and as necessary to meet warranty requirements.

C. Follow manufacturers' recommendations concerning protection of glass, metal and other non-porous substrates. Contractor will be responsible to clean all surfaces that are contaminated by the anti-graffiti coating.

END OF SECTION

DIVISION 10 SPECIALTIES
SECTION 10 11 00 VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Marker boards, and Tack boards as indicated on the drawings regardless of type of surface on which mounted.

1.02 SUBMITTALS

- A. Shop Drawings: Provide shop drawings for visual display boards in accordance with Sections 01 33 00 and 01 33 23.
- B. Color Selection Chart: Provide color selection chart for Architect's selection. Provide actual material samples if requested by Architect.

1.03 DELIVERY, STORAGE AND HANDLING

Deliver and store in original crates under cover in accordance with manufacturer's recommendations.

1.04 WARRANTY

Manufacturer shall provide fifty (50) year warranty on finish of markerboards.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers - Visual Display Boards, Trim and Accessories:
 1. Polyvision, a Steelcase Company
 2. Tri-Adco Manufacturing Co.
 3. ADP / lemco, Inc.
 4. Claridge Products and Equipment, Inc.
 5. Platinum Visual Systems
 6. Ghent Manufacturing, Inc.
 7. Newline Products, Inc.
 8. or approved substitute

2.02 MARKERBOARDS

- A. Porcelain Enamel Steel Board as manufactured by Polyvision, or equivalent of other acceptable manufacturer.
 1. Face sheet metal shall be 28 gauge or heavier.
 2. Core material shall be particleboard with overall thickness not less than 7/16".
 3. Back shall be .015" thick aluminum sheet.
 4. Pre-frame boards at the factory into trim system specified.
 5. Color shall be as selected by Architect from manufacturer's standard colors.
 6. Size shall be 5'-0" high x length indicated on drawings.
- B. Particleboard shall contain no added urea-formaldehyde resins.
- C. Boards up to 12' in length shall be in one piece. Boards of greater length shall be joined by a concealed spline system for a tight flush joint. Surface applied trim at butt joints will not be accepted.

2.02 TACKBOARDS

- A. 1/4" thickness colored cork.
 - 1. Tack surface composed of linoleum-resilient homogenous tackable surface material consisting of linseed oil, granulated cork, and rosin binders, with color uniform throughout the thickness of the cork.
 - 2. Factory laminated to 1/4" thick hardboard backing.
 - 3. Pre-frame at the factory into trim system specified.
 - 4. Color as selected by Architect from standard colors.
 - 5. Size shall be 4'-0" high x length indicated on drawings.

2.02 TRIM SYSTEM AND ACCESSORIES

- A. Prefabricated Trim System: "Traditional" Series 110 or equivalent of other acceptable manufacturer. Provide manufacturer's concealed hanger clips.
- B. Accessories: Each markerboard unit shall be equipped with a continuous top display rail.
- C. Display rail inserts shall match tackboard. Glue strip into display rail and provide removable end caps.
- D. Finish: Exposed trim and accessories shall be extruded 6063-T5 aluminum alloy with clear anodized finish.

PART 3 - EXECUTION

3.01 INSTALLATION

See floor plan for locations and types of tack boards. Mount units on walls using sheet metal screws or screws and rawplugs. Locate sheet metal screws only at steel studs, use sufficient length to fasten units to studs. Provide blocking within gypsum board partitions as necessary to secure boards to walls.

END OF SECTION

SECTION 10 14 00 IDENTIFYING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. **Interior ADA Unframed Tactile Signs**
 - 2. Building Mounted Letters and Numerals

- B. Related Sections:
 - 1. Signage: Section 10 14 53
 - 2. Mechanical and Electrical Identification: Divisions 23 and 26

1.02 SUBMITTALS

- A. Shop Drawings: Provide shop drawings and signage schedule in accordance with Sections 01 33 00 and 01 33 23.

- B. Samples: Submit full range of colors for Architect's selection.

- C. Sample Sign: Submit actual sample of each sign type for approval.

PART 2 - PRODUCTS

2.01 ADA COMPLIANT TACTILE SIGNS

- A. Acceptable Manufacturers:
 - 1. Signage Inc.
 - 2. Best Manufacturing Co.
 - 3. ASI Sign Systems
 - 4. SignWorks, LLC
 - 5. Platte Valley Signs
 - 6. Communication Industries, Inc.
 - 7. Leisure Time Products
 - 8. Division Ten Signage Corp.
 - 8. Exact Sign Systems
 - 9. Gordon Sign Company
 - 10. SignWorks LLC
 - 11. Avalanche Sign Manufacturing
 - 12. Precision Sign company
 - 13. or approved substitute

- B. General Signage Description:
 - 1. Raised numbers, letters, pictograms, and Braille shall be precision routed utilizing manufacturer's standard solid color material, surface painted not allowed. Exposed surfaces of all sign types shall have solid color as selected by Architect. Text and background shall be contrasting colors, matte finish with 70% contrast between letters and background color.
 - 2. Backplate: .125 acrylic.
 - 3. Faceplate: .080 clear matte acrylic.
 - 4. Corners: 1/2" machine radiused.
 - 5. Raised Text: Individual characters shall be set into routed recess conforming to the character shape using manufacturer's standard solid color letter material. Grade II Braille,

raster beads set into faceplate. Lettering to be raised 1/32" x 5/8" minimum height Helvetica Medium, upper case.

2.02 SIGN TYPES (ADA COMPLIANT TACTILE SIGNS)

- A. Room Signs: See Interior Signage Schedule for permanent message copy.
1. Size: Rooms signs with number and text shall be 7" high x 7" wide, maximum.
 2. Text Size: 1/32" raised, 1" high numbers and 5/8" letters, Helvetica Medium, upper case, left justified.
 3. Braille: Grade 2, raster beads, text and numbers.
- B. Symbol Signs: Provide at Toilet Rooms.
1. Size: 7" wide x 9" high.
 2. Symbol: 1/32" raised. 3" high minimum symbols as directed by Architect.
 3. Lettering: 1/32" raised, 1" high Helvetica Medium, upper case, left justified.
 4. Braille: Grade 2, raster beads, text and numbers.
- C. Tactile Exit Signs: See schedule for copy of permanent message.
1. Size: 3" wide x 2" high.
 2. Text Size: 1/32" raised, 1" high numbers, Helvetica Medium all capitals, left center copy, all one line.
 3. Braille: Grade 2, raised 1/32".
 4. Finish: Color as selected by Architect from full range of manufacturer's standard colors. Text and background will be contrasting colors, matt finish.
- D. Room Capacity Sign:
1. Size: 7" wide x 7" high.
 2. Lettering: 1/32" raised, 3/4" high Helvetica Medium, upper case, centered.
 3. Text: MAXIMUM
OCCUPANY
XXX (Actual number as occurs.)

2.04 BUILDING NUMERALS

- A. Cast aluminum numerals, Helvetica type face as manufactured by A.R.K. Ramos or approved substitute. Finish, anodized aluminum or custom color baked enamel as selected by Architect.
- B. Provide 8" high numerals – total of 4.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. ADA Compliant Tactile Signs:
1. Install signs with adhesive foam tape and tamper resistant adhesive around perimeter in accordance with approved layout.
 2. Install signage backplane on opposite side of glass when room signage is mounted to glazing.
 3. Provide sealant around all edges of signs and backplanes.
- B. Exterior Building Numerals: Projected mount with collars and threaded studs set in adhesive, as recommended by manufacturer and as shown on approved shop drawings.

END OF SECTION

**INTERIOR SIGNAGE SCHEDULE
DEERFIELD HILLS COMMUNITY CENTER ADDITIONS & ALTERATIONS**

SIGNAGE SCHEDULE NOTES:

1. "SIGN LOCATION" INDICATES DOOR NUMBER IDENTIFIED ON THE FLOOR PLANS
2. "SIGN TYPE" REFERS TO SIGN DESCRIPTION UNDER SUBSECTION 2.02 IN SPECIFICATION SECTION 10 14 00
3. "ROOM NO." REFERS TO ACTUAL COPY TO BE INCLUDED ON SIGN.
4. EQUIVALENT GRADE 2 BRAILLE TO BE PROVIDED FOR ALL ROOM NO'S, PERMANENT TEXT AND PICTOGRAMS.
5. ALL ROOM SIGNAGE SHALL BE INSTALLED 48" ABOVE THE FLOOR TO THE SIGN CENTERLINE AND LOCATED ON THE WALL ADJACENT THE LATCH SIDE OF THE DOOR. LEAVE 1 1/2" CLEAR BETWEEN THE SIGN EDGE & THE DOOR FRAME.

END OF SECTION

10 14 00 - 4

SECTION 10 14 53 SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Traffic Control Signs and Posts
- B. Related Section: Construction Facilities and Temporary Controls: Section 01 50 00

1.02 SUBMITTALS

Shop Drawings and Product Data: Submit for approval in accordance with Sections 01 33 00 and 01 33 23.

1.03 REFERENCES

Signage shall comply with the requirements of the Manual on Uniform Traffic Control Devices (current edition), and Colorado Supplements adopted by the Colorado Department of Transportation.

1.04 QUALITY ASSURANCE

- A. Comply with Specifications and referenced standards as minimum requirements.
 - 1. Manufacturers and systems listed within this specification section are acceptable, subject to their fully meeting the detail requirements of the section.

PART 2 - PRODUCTS

2.01 TRAFFIC CONTROL SIGNS

- A. Acceptable Manufacturers or Suppliers:
 - 1. Vulcan Signs, Inc.
 - 2. Midwest Barricade
 - 3. Signage Inc.
 - 4. Scott Sign Systems, Inc.
 - 5. Best Sign Systems, Inc.
 - 6. approved substitute
- B. Materials: .080" aluminum traffic control signs as manufactured by Vulcan Signs, Inc. or equivalent of other acceptable manufacturer. Standard Engineer Grade Reflective Sheeting on sign face, mounted on 12 gauge 2-1/4" x 2-1/4" galvanized steel posts with perforations as required for attachment of signage to post. Provide all accessories required to install signage on posts. Size and text of lettering as indicated on the drawings.
- C. Breakaway Base: Yielding Breakaway Base as manufactured by Vulcan Signs or equivalent of other acceptable manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

Set traffic control sign posts in breakaway sleeve as indicated. Coordinate direction of sign face with Architect prior to setting posts.

END OF SECTION

SECTION 10 21 13.16 SOLID PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Solid Phenolic Toilet Compartments
- B. Related Sections:
 - 1. Rough Carpentry: Section 06 10 00
 - 2. Toilet Accessories: Section 10 28 13

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with Sections 01 33 00 and 01 33 23.
- B. Submit color samples of full range of manufacturer's standard colors for selection by Architect.

1.04 PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Partition materials shall comply with the following requirements, when tested in accordance with the ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
 - 1. Smoke Developed Index: Not to exceed 25
 - 2. Flame Spread Index: Not to exceed 15
 - 3. Material Fire Ratings:
 - a. National Fire Protection Association (NFPA): Class A
 - b. International Code Council (ICC): Class A

1.03 DELIVERY, STORAGE AND HANDLING

Deliver and store in original crates under cover.

PART 2 - PRODUCTS

2.01 SOLID PHENOLIC TOILET PARTITIONS

- A. Acceptable Manufacturers:
 - 1. Bobrick, Duraline 1182 Series
 - 2. Accurate Partitions, Phenolic
 - 3. General Partitions, Solid Phenolic
 - 4. approved substitute
- B. Toilet Partitions: Flush type solid phenolic resin panels with fused melamine surface, floor mounted, overhead braced, manufacturer and model as listed above.
- C. Toilet Partition Construction:
 - 1. Doors and Pilasters: 3/4" thick solidly fused plastic laminate matte finish melamine surface on black phenolic-resin core. Edges are polished black, face color as selected by Architect.
 - 2. Partitions: 1/2" thick, same material as doors and pilasters.
 - 3. Head rail: Head rail tubular anti-grip type clear satin extruded aluminum attached and bolted through top of pilasters. Tubular bracing shall extend full length of installation and over end compartment and be fastened into wall bracket.
 - 4. Hardware and Fittings: Institutional hardware package. Dividing partitions shall be attached to pilasters and wall with continuous stainless steel U-channels. Base of pilasters and floor anchorage shall be concealed by 3" high Type 304 stainless steel plinth. Doors shall be equipped with continuous stainless steel gravity hinges. All panel connections with factory -installed threaded inserts and stainless steel theft-resistant screws.

5. Accessories: Each door shall be equipped with one cast alloy chrome plated coat hook and bumper and cast alloy chrome-plated combination doorstop and latch keeper. Provide door pulls for out-swinging doors. Provide Glynn-Johnson Model 60W, or approved substitute satin chrome surface-mounted wall stop at receiver of door bumpers which strike gypsum board walls.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Erect plumb, level, and true and securely attach to walls and floors in accordance with manufacturer's instructions, installation details, and approved shop drawings. Exercise care to avoid damage to the toilet partitions, walls, or floors. Install wood blocking in accordance with Section 06 10 00 behind gypsum board partitions as necessary to secure partition anchors and hardware.
- B. Refer to Toilet Accessory Schedule on drawings and Section 10 28 13 for coordination with specific accessories.

END OF SECTION

SECTION 10 26 13 CORNER AND WALL GUARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. High Impact Solid Color PVC Corner Guard System
 - 2. High Impact Solid Color PVC Wall Guard (Chair Rail) System

- B. Related Sections:
 - 1. Gypsum Board Partitions and Walls: Section 09 21 00
 - 2. Masonry Corners: Section 04 20 00

1.02 SUBMITTALS

- A. Product Data: Submit in accordance with Sections 01 33 0 and 01 33 23.

- B. Samples: Submit full range of manufacturer's standard colors, minimum of twelve (12) colors of the specified product for selection by Architect.

PART 2 - PRODUCTS

2.01 CORNER AND WALL GUARDS

- A. Acceptable Manufacturers:
 - 1. Institutional Products Corporation (IPC)
 - 2. Koroseal Surface Mounted Cornerguards
 - 3. Pawling Corporation
 - 4. Construction Specialties, Inc.
 - 5. Tepromark International Inc.
 - 6. Balco Inc.
 - 7. or approved substitute

- B. Corner Guard Description: IPC 150BN BluNose High Impact Corner Guard or equivalent of other approved manufacturer.
 - 1. Material: 0.080 inch thick scratch and stain resistant rigid vinyl cover.
 - 2. Size: 3" x 3" minimum x 4'-0".
 - 3. Configuration: 90 degree angle and other angles as indicated on drawings.
 - 4. Mounting: 0.070 inch thick pre-slotted continuous aluminum retainer.
 - 5. Fire Rating: Class A (ASTM E84).
 - 6. Color: As selected by Architect from manufacturer's standard colors.

- C. Wall Guard (Chair Rail) Description: IPC 200 Wall Guard or equivalent of other approved manufacturer.
 - 1. Material: 0.080 inch thick scratch and stain resistant rigid vinyl cover.
 - 2. Size 1-1/8" high by 1-1/8" deep
 - 3. Mounting: 0.080" thick continuous aluminum retainer
 - 4. Fire Rating: Class A (ASTM E84).
 - 5. Color: As selected by Architect from manufacturer's standard colors.

- D. Corner Guards and Wall Guards shall both be provided by the same manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. **Corner Guards:** Install as indicated on the Drawings, over wall corners using mounting techniques in accordance with manufacturer's instructions. Butt bottom edge of corner guard to top of resilient base.

- B. **Wall Guards:** Install where indicated on the Drawings, in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 26 13 CORNER GUARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. High Impact Solid Color PVC Corner Guard System
- B. Related Sections:
 - 1. Gypsum Board Partitions and Walls: Section 09 21 00

1.02 SUBMITTALS

- A. Product Data: Submit in accordance with Sections 01 33 0 and 01 33 23.
- B. Samples: Submit full range of manufacturer's standard colors, minimum of twelve (12) colors of the specified product for selection by Architect.

PART 2 - PRODUCTS

2.01 CORNER GUARDS

- A. Acceptable Manufacturers:
 - 1. Institutional Products Corporation (IPC)
 - 2. Koroseal Surface Mounted Corner guards
 - 3. Pawling Corporation
 - 4. Construction Specialties, Inc.
 - 5. Tepromark International Inc.
 - 6. Balco Inc.
 - 7. or approved substitute
- B. Corner Guard Description: IPC 150BN BluNose High Impact Corner Guard or equivalent of other approved manufacturer.
 - 1. Material: 0.080 inch thick scratch and stain resistant rigid vinyl cover.
 - 2. Size: 3" x 3" minimum x 4'-0" or as noted on the drawings.
 - 3. Configuration: 90 degree angle and other angles as indicated on drawings.
 - 4. Mounting: 0.070 inch thick pre-slotted continuous aluminum retainer.
 - 5. Fire Rating: Class A (ASTM E84).
 - 6. Color: As selected by Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Corner Guards: Install as indicated on the Drawings, over wall corners using mounting techniques in accordance with manufacturer's instructions. Butt bottom edge of corner guard to top of resilient base.

END OF SECTION

SECTION 10 28 13 TOILET AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Toilet Accessories

1.02 SUBMITTALS

- A. Submit product data on items furnished under this Section in accordance with Sections 01 33 00 and 01 33 23.
- B. Submit shop drawings for stainless steel wall panels including plans, elevations and detail sections. Indicate jointing, fasteners, anchorage, accessory items, and specified finishes in accordance with Sections 01 33 00 and 01 33 23.
- C. Submit samples for verification purposes in 8 inch square units of each metal finish indicated, prepared on metal of same composition and thickness to be used in final construction.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Store products on elevated platforms in a dry location.

1.04 PROJECT CONDITIONS

Field Measurements: Verify size, location, and placement of stainless steel panels with adjoining construction prior to fabrication.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

Acceptable Manufacturers:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation
4. GAMCO
5. or approved substitute

2.02 MATERIALS

- A. Accessory Type Schedule: See Accessory Schedule on drawings. Unless indicated otherwise, all accessories by Bobrick or equivalent of other acceptable manufacturer.
- B. Accessories Furnished by Owner: Refer to Accessory Schedule for items furnished by Owner for installation by Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fasten accessories rigidly and securely to walls using methods and materials recommended by manufacturer. Provide wood blocking or plywood in stud cavity for mounting accessories to gypsum board partitions.
- B. Protect mechanical finishes on exposed surfaces from damage by application of adhesive paper or other temporary protective covering, prior to shipment. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 10 44 00 FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Fire Extinguisher Cabinets
 - 2. Fire Extinguishers for Fire Extinguisher Cabinets

- B. Related Sections:
 - 1. Painting: Section 09 91 00
 - 2. Lockers: Section 10 51 00

1.02 SUBMITTALS

Product Data: Submit product data for fire extinguishers, fire blankets, and cabinets indicating type and location in accordance with Sections 01 33 00 and 01 33 23.

PART 2 - PRODUCTS

2.01 FIRE EXTINGUISHERS AND CABINETS

- A. Acceptable Manufacturers:
 - 1. J.L. Industries
 - 2. Larsen's Manufacturing Company
 - 3. Norris Industries
 - 4. Seco Manufacturing, Inc.
 - 5. Elkhart Brass Manufacturing Company
 - 6. General Fire Extinguisher Corporation
 - 7. Potter-Roemer
 - 8. or approved substitute

- B. Non-Rated Fire Extinguisher Cabinets: Larsen's Manufacturing Co., Model 2409-6R steel cabinet and door, or equivalent of other acceptable manufacturer with 24" x 9-1/2" x 6" minimum inside dimensions. Cabinet door shall be solid flush door with optional recessed cup handle, or Vertical Duo Door with tempered glazing. Cabinet finish shall be factory painted acrylic enamel as primer coat for field paint. Furnish red decal reading "FIRE EXTINGUISHER" for job application. Cabinet shall be semi-recessed with rolled edges. No part of cabinet shall protrude more than 4" from wall.

- C. Keying: Provide Larsen-Loc Locking Mechanism or equivalent of other acceptable manufacturer, providing emergency access without breaking glass. Provide two (2) keys per cabinet (Larsen's Key CH751 or J.L. Key BH005).

- D. Fire Extinguishers: 10 pound ABC multi-purpose dry chemical type, typical.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Cabinets: Install cabinets according to manufacturer's instructions. Install cabinet with door handle height of 4'-0" A.F.F. Paint cabinets, color as selected by Architect, in accordance with Section 09 91 00. Apply decals on cabinets after cabinets are field painted.

B. Extinguishers: Install in cabinets, as shown. Leave fully charged.

END OF SECTION

Not for Construction

SECTION 10 51 00 LOCKERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Employee Lockers

- B. Related Sections
 - 1. 06 10 00 Rough Carpentry
 - 2. 06 41 00 Custom Casework
 - 3. 09 21 00 Gypsum Board Partitions and Walls

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for lockers and related items in accordance with Sections 01 33 00 and 01 33 23.

- B. Samples: Submit actual color samples on metal from manufacturer's full range of standard colors.

1.03 DELIVERY, STORAGE AND HANDLING

Deliver and store lockers and related items in original crates under cover.

1.04 MAINTENANCE

- 1. Touch-Up Paint: Provide 8 fluid ounces.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers - Standard Lockers:
 - 1. Republic Storage Systems Co.
 - 2. Lyon Metal Products, Inc.
 - 3. Art Metal Products
 - 4. Penco Products, Inc.
 - 5. Hadrian
 - 6. ASI Storage Solutions, Inc.
 - 7. or approved substitute

2.02 LOCKER TYPES AND SIZES *

Metal lockers shall be the following types and sizes of the quantities and arranged in the groups indicated on the drawings. See following articles for detailed description of each type of locker.

- A. Lockers: Quiet type Lockers, Triple tier, 12" wide, 12" deep, 72" high (each locker 24"), mounted on wood base as indicated. Provide one double prong back hook, and two single prong wall hooks. Flat top. Recessed handle with pad lock hasp. Provide one unit with Republic "Digilock" ADA-compliant digital lock providing one-touch access by attaching a button key to the lock face.

3.03 "QUIET" LOCKERS

Republic Quiet Lockers or equivalent of other acceptable manufacturer.

- A. Material: Construct doors and frames of pickled, cold-rolled and patent leveled sheet steel. Construct other parts from good grade annealed specially treated and patent leveled steel. All steel to be free from buckle, scale, and other imperfections. Sheet steel shall be capable of taking a high grade enamel finish.

- B. Body: Construct body of locker of not less than 24 gauge steel with necessary formation to make rigid locker and to ensure tight joints between bolts.
- C. Tops, Bottoms, and Tier Dividers: Constructed of 24 gauge steel. Provide necessary fillers for lockers as indicated or needed.
- D. Fillers : Provide 24 gauge steel blank front and top filler pieces of size required wherever groups of lockers adjoin in corners yet do not meet or wherever lockers abut walls.
- E. Not used
- F. Doors: Construct doors of 16 gauge cold-rolled sheet steel adequately flanged. Formations shall consist of two right angles at lock side of doors, two right angles at hinge side and one right angle formation at top and bottom. Weld all flanges together at corners. Doors shall have standard ventilation air flow slots located in the top & bottom flange of the door. The door front shall be flush with no exposed louvers.
- G. Door Frames: Construct door frames of not less than 16 gauge steel formed into 1" wide face channel shapes with a continuous vertical door strike integral with the frame on both sides of the door opening. Frame channel formation shall be securely welded together.
- H. Latching Device: Latching shall be a one-piece, pre-lubricated spring steel latch, completely contained within the lock bar under tension to provide rattle-free operation. The lock bar shall be of pre-painted, double channel steel construction. Latching device shall allow locker to be locked while door is open, then closed without unlocking and without damaging locking mechanism. There shall be two (2) latching points on multi-tier lockers. Frame hooks to accept latching shall be of heavy gauge steel welded to the door frame. Provide rubber silencers installed on each frame hook. Provide provisions for padlocks as indicated in locker type description.
- I. Hinges: Five (5) knuckle hinges shall be at least two (2) inches high of the full loop, tight inset type, securely welded to frame and riveted to door with two rivets per hinge leaf. Locker doors 42" high and less shall have two hinges.
- J. Hooks: Provide hooks as noted. Hooks shall be zinc-plated forged steel with ball ends. Attach hooks with two bolts.
- K. Number Plates: Provide each locker with polished aluminum number plates, aluminum background and etched blank numerals not less 1/2" high. Attach plates with split rivets. Number lockers per Owner's directions.
- L. Finish: Thoroughly clean and phosphatize all steel parts. Finish with a heavy coat of high quality enamel. Enamel shall be baked at 300 degrees for minimum of 30 minutes. Where bolt heads are visible on outside of locker, finish to match balance of locker. Bolts and nuts to be rust proofed before finishing.
- M. Color: Standard color as selected by the Architect from full range of manufacturer's colors. Up to one color may be selected.

PART 3 - EXECUTION

3.01 EXAMINATION

Verification of Conditions: Before beginning installation, examine surfaces to receive lockers for any conditions that would adversely affect the installation. If such conditions are noted, they shall be corrected by the Contractor before the work proceeds.

3.02 INSTALLATION

Install in accordance with manufacturer's approved drawings and assembly instructions. Installation to be level and plumb with flush surfaces and rigid attachment to anchoring surfaces.

3.05 ADJUSTING AND CLEANING

Upon completion of installation, inspect lockers and adjust as necessary for proper door and locking mechanism operation. Touch up scratches and abrasions with factory supplied paint to match original finish. Remove packing material and debris from the site.

END OF SECTION

Not for Construction

SECTION 12 21 13.13 HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.01 SUMMARY

Section Includes: Horizontal Louver Blinds.

1.02 SUBMITTALS

- A. Product Data: Submit product data in accordance with Section as specified under Sections 01 33 00 and 01 33 23.
- B. Samples: Submit complete set of color samples for Architect's selection.

1.03 DELIVERY, STORAGE AND HANDLING

Comply with Section 01 60 00.

PART 2 - PRODUCTS

2.01 HORIZONTAL LOUVER BLINDS

- A. Acceptable Manufacturers and Types:
 - 1. Hunter Douglas Inc. - (Model CD 80)
 - 2. Levolor – Riviera
 - 3. or approved substitute
- B. Description:
 - 1. High quality 0.008" thick x 1" wide heat treated and spring tempered solid aluminum alloy slats with factory applied anti-static paint additive to inhibit dust build-up.
 - 2. Worm and gear tiler with clutch action with tilt wand and Cord Lock Control.
 - 3. Blinds shall span full width of window
 - 4. Inside window mount.
 - 5. Color as selected by Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

Install blinds in brackets as recommended by manufacturer at locations indicated on the drawings.

END OF SECTION

DIVISION 12 FURNISHINGS
SECTION 12 32 00 PLASTIC LAMINATE FACED CASEWORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plastic laminate cabinets, counters, shelving, and casework
2. Plastic laminate countertops
3. All special units such as file drawer units, open shelving, and knee space drawers
4. All necessary hardware and accessories

B. Related Sections:

1. Custom Casework: Section 06 41 00
2. Finish Carpentry: Section 06 20 00
3. Rough Carpentry: Section 06 10 00
4. Gypsum Board Partitions and Walls: Section 09 21 00
5. Resilient Flooring: Section 09 65 00
6. Mechanical: Division 23
7. Electrical: Division 26

1.02 DEFINITIONS

The following definitions apply to plastic laminate faced casework units:

1. Exposed surfaces of casework include surfaces visible when doors and drawers are closed and visible surfaces in open shelf units.
2. Semi-exposed surfaces of casework include surfaces behind doors, such as shelves, dividers, interior faces of ends, cabinet backs, drawer sides, and bottoms, and interior faces of doors. Tops of units 78" or more above floor shall be considered as semi-exposed.
3. Concealed surfaces of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.03 COORDINATION

Coordinate rough-in and opening dimensions of Owner and contract furnished appliances and equipment, sinks, and items specified under other Sections to be built into or adjacent to casework. Contractor shall coordinate and schedule work to ensure casework and built-in equipment are installed in an expeditious manner, fit properly together, and tightly fits in space provided.

1.04 SUBMITTALS

A. General: Submit in accordance with Sections 01 33 00 and 01 33 23.

B. Product Data: Submit manufacturer's data and installation instructions for each type of plastic faced casework unit. Submit product data on each type of hardware and accessory item.

C. Shop Drawings: Submit shop drawings for plastic faced casework and countertops showing layout, elevations, ends, cross sections, service run spaces, and location of services. Where selected plastic laminate color / pattern is directional, indicate pattern direction. Pattern direction across door and drawer fronts shall be vertical, and must align and match vertically.

D. Countertop layouts shall show plastic laminate joints, and countertop thickness. Show details and location of anchorages and fitting to floors, walls, and base. Indicate all hardware and

accessory items. Include layout of units with relation to surrounding walls, doors, windows, and other building components. Coordinate shop drawings with other work involved.

- E. Samples: Submit complete set of plastic laminate samples including all available solids, matrix, nebulas, and wood grains, (including standard and non-standard Wilsonart colors) except metallic colors, to the Architect for color selection. Submit full range of PVC edge samples including solids, matrix, nebulas and wood grains for Architect's color selection. (Approximately 250 colors 1mm PVC and approximately 25 colors for 3mm PVC.). Also submit samples of hinges, door and drawer pulls, and grommets.
- F. Submit one full size sample of finished base and wall cabinet units complete with hardware, doors and drawers, without finish top, if requested by Architect.
 - 1. Acceptable sample units will be used for comparison inspections at the project. Unless otherwise directed, acceptable sample units may be incorporated in the work. Notify Architect of their exact locations. If not incorporated in the work, retain acceptable sample units in the building until completion and acceptance of work.
 - 2. Remove sample units from the premises when directed by the Architect.

1.05 QUALITY ASSURANCE

- A. Single Source Responsibility: All plastic faced casework and countertops shall be provided by the same casework manufacturer for single source responsibility and integration with other building trades.
- B. Substitutions: Refer to Document 00 21 13 and Section 01 60 00 for requirements.
- C. Reference Standards:
 - 1. As a minimum, material and workmanship shall conform to the custom grade requirements of "Architectural Woodwork Quality Standards", latest edition, as published by the Architectural Woodwork Institute. Where more stringent requirements are desired, they will be specifically noted.

1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Section 01600. Do not deliver cabinets until the building or storage area is enclosed and sufficiently dry to prevent damage from excessive changes in moisture content.
- B. Storage and Protection: Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

PART 2 - PRODUCTS

2.01 PLASTIC LAMINATE FACED CASEWORK

- A. Acceptable Casework Manufacturers:
 - 1. TMI Systems Design Corporation
 - 2. LSI Corporation
 - 3. Sidney Millwork Company
 - 4. Salina Planing Mill, Inc.
 - 5. General Casework, Inc.
 - 6. Cab-Con Enterprises, Inc.
 - 7. Quality Custom Woodwork, Inc.
 - 8. Westmark Products, Inc.
 - 9. Colorado Springs Millwork, Inc.
 - 10. Concepts in Millwork, Inc.
 - 11. Vass Incorporated

12. Nelson Interior Construction, Inc.
13. or approved substitute

B. Acceptable Plastic Laminate Manufacturers:

1. Wilsonart
2. Formica
3. Nevamar
4. Laminart
5. or approved substitute

C. Manufacturer and Type: **Manufacturers and systems listed within this specification section are acceptable subject to their fully meeting the detail requirements of this section.** Casework shall be as provided by TMI Systems Design Corporation or equivalent of other acceptable manufacturer. Successful bidder shall construct per the TMI standards and details stated within this section. Provide all features and accessories per the referenced TMI unit.

D. Casework Materials:

1. Cabinet Material: Medium Density Industrial (minimum average of 45 pounds / cubic foot) Particleboard, minimum 3/4" thick, meeting ANSI 208.1 M3 PB Specifications, containing no added urea-formaldehyde resins.
2. Plastic Faces: The following general guidelines apply to plastic faces of casework in accordance with definitions stated in Article 1.02:
 - a. Exposed Surfaces: Vertical Grade High Pressure Decorative Laminate complying with NEMA LD-3 Performance Test, .030" thick.
 - b. Semi-Exposed and Concealed Surfaces: Thermally fused Melamine laminate or nominal.020" cabinet liner, as required to balance individual piece.
 1. Color: Painted surfaces not acceptable. Architect shall select color from White, Light Beige, Dove Gray, Almond or Putty.
3. PVC Edging: Cabinet body and shelf edges shall be covered with actual 1 mm thickness PVC edge-banding. Door and drawer front edges shall be covered with 3 mm PVC edge-banding. Plastic laminate edging is not acceptable. PVC edge-banding shall be applied with hot melt glue, no exceptions. A maximum of four (4) PVC colors may be selected.

2.02 HARDWARE AND ACCESSORY ITEMS

- A. Hinges: Five knuckle, 2-3/4" high, overlay type, .095" thick steel hinge with standard color epoxy powder coat or metallic finish as selected by Architect. Hinges shall have a minimum of eight (8) total case body and leaf fastenings. Doors 48" and over in height shall have three (3) hinges per door.
- B. Door and Drawer Pulls: Solid color semi-**recessed A.B.S. plastic (ADA compliant size) or** epoxy powder coat or metallic finish metal wire pulls. Standard color as selected by Architect.
- C. Drawer Suspensions: Each drawer shall be equipped with one pair of ball bearing nylon roller suspensions which shall be self-closing from a four (4) inch extension, have a minimum load capacity of seventy-five (75) pounds, and be constructed of zinc coated rolled steel. Knee space drawers shall be equipped with suspensions with a minimum load capacity of fifty (50) pounds each. Heavy duty paper storage and file drawers shall be equipped with full extension suspensions with a minimum load capacity of one hundred (100) pounds each.
- D. Drawer Stops: Drawers shall be equipped with two (2) drawer stops attached to the drawer face. The cabinet drawer stops shall be self-adhered rubber and be installed to prevent the drawer face from touching the cabinet body when the drawer is in a closed position.

- E. Door Catches: Magnetic type with a maximum five (05) pound pull, attached with screws and slotted for adjustment. Provide thumb latch on inactive leaf on pair of doors.
 - F. Shelf Supports: Heavy duty, self-locking nylon or polycarbonate, designed for installation in pre-drilled holes in cabinet ends and vertical partitions.
 - G. Door and Drawer Locks: Five (5) disc tumbler, cam type, keyed alike or differently and master keyed. Each different lock shall be furnished with two keys. Fifty (50) lock changes available.
 - H. Chain Bolts: Three (3) inches long with 18" pull chain with angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors up to and including 72" in height.
 - I. Coat Rods: 1-1/4" diameter, 14 gauge chrome plated steel rod with supports. Provide at tall cabinets and closet rod / shelves where indicated.
 - K. Tote Trays: Heavy duty formed plastic type with full top rim and pull. Each tray shall be equipped with plated steel label holder.
 - L. Mirrors: 1/4" thick polished plate mirror attached with plastic clips and metal screws at each wardrobe cabinet and as indicated.
 - M. Casters: Heavy duty ball bearing type with non-marking hard rubber tread, bright zinc plated. Cabinet height shall require three (3) inch casters. All other application shall require either four (4) or five (5) inch casters.
 - N. File Drawers: Provide Pendaflex file suspension rails, and steel plate and rod file index followers recessed in bottom of file drawers.
 - O. Conduit Sleeves: Doug Mockett EPD3, plastic 2-1/2" flip-top grommet set in top of work stations.
 - P. Keyboard Tray:
 - 1. Articulating keyboard tray with sliding mouse tray. TMI A2310, Workrite 2175-22N with 2180S, or approved substitute.
 - 2. Retractable keyboard tray. TMI A2320 or approved substitute.
 - Q. Pencil Drawer: As detailed on the Drawings
- 2.03 CASEWORK FABRICATION
- A. General: Fabricate plastic laminate faced casework to dimensions, profiles, elevations, and details shown on drawings. Assemble units in the shop in as large of components as practicable to minimize field cutting and jointing. All joints shall be doweled and glued.
 - B. Tall storage cabinet doors adjacent to countertops shall have a chain stop sized to prevent doors from striking countertop edge in the fully open position. Countertop edge adjacent to tall storage cabinets shall have a 45 degree bevel.
 - C. Cabinet Joinery: Tops and bottoms shall be joined to cabinet ends using a minimum of six (6) dowels for twenty-four (24) inch deep cabinets and a minimum of four (4) dowels for twelve (12) inch deep cabinets. All dowels shall be hardwood laterally fluted with chamfered end. Internal cabinet components such as fixed horizontal shelves, rails, and vertical dividers shall be doweled in place. Dowels shall be securely glued and cabinets clamped under pressure during assembly to ensure secure joints and cabinet squareness.

- D. Cabinet Bases: Manufacturer's standard integral or separate cabinet toe-kick base.
 - E. Cabinet Top and Bottom: 3/4" thick particleboard.
 - F. Cabinet Ends: 3/4" thick particleboard. Holes shall be drilled for interior adjustable shelf clips at 32 mm (1-1/4") on center. Ends shall be bored to accept doweled top and bottom. All ends shall be rabbeted to accept recessed back.
 - G. Fixed Intermediate and Adjustable Shelves: Shelves up to 30 inches wide shall be 3/4" thick particleboard. Shelves 30" to 36" wide shall be 1" thick particleboard. Casework units wider than 36" shall have fixed vertical dividers.
 - H. Cabinet Backs: Concealed backs shall be 1/4" thick prefinished hardboard glued into cabinets. Sink cabinets shall have split back, removable from inside. Exposed backs on fixed cabinets shall be 3/4" thick particleboard.
 - I. Cabinet Doors and Drawer Fronts:
 - 1. 3/4" thick particleboard with PVC edging as described in Article 2.01, Paragraph D. PVC edging shall be buffed to leave edges and corners smooth and slightly rounded. Double doors shall be provided on all cabinets wider than 24".
 - 2. Where selected plastic laminate color / pattern is directional, direction of pattern shall be vertical and all exposed faces and fronts shall match.
 - 3. Where "Marker Board" is indicated on face of door, marker board writing surface shall be Wilsonart Marker Board Laminate, or approved substitute of other acceptable manufacturer. Material shall be vertical grade .030", gloss finish. Color as selected by Architect.
 - J. Drawers: Sides, back, and sub front shall be 1/2" thick particleboard. The back and sub front shall be doweled and glued into the sides; no staples or nails are permitted. Dowels shall be spaced 32 mm (1-1/4") on center. Dowels shall be hardwood, laterally fluted, with chamfered ends. Drawer bottom shall be 1/4" thick prefinished hardboard, let into sub front, sides, and back. Paper storage drawers shall be heavy duty 3/4" particleboard construction with 100 pound full extension slides, plywood reinforcement stiffener at bottom, and retaining hood at the rear of each drawer.
 - K. Vertical Dividers: 3/4" thick particleboard. Provide in cabinets as indicated by TMI specified model number and in all cabinet units over 36" wide.
 - L. Removable Knee-Space Panel: Removable panel at knee spaces (conceals plumbing) shall be considered as an "exposed surface" for surface finish and shall be edged in 1mm PVC.
- 2.04 PLASTIC LAMINATE COUNTERTOPS AND BACKSPLASH
- A. Countertops and Back / End Splashes: Medium Density Industrial (minimum average of 45 pounds per cubic foot) particleboard, meeting ANSI 208.1 M2PB Specifications, and containing no added urea formaldehyde resins. Minimum 1" thick at countertops. Splashes shall be minimum 3/4" thick particleboard. Attach splash to countertop as detailed, fasten and glue solid. Seal joint between countertop and splash with acrylic latex caulking to be watertight.
 - 1. Tops with sink cut-outs shall be moisture resistant medium density (45 pounds per cubic foot) particleboard.
 - B. Plastic Laminate: General Purpose Grade High Pressure Decorative Laminate, .050" thick, complying with NEMA LD-3 Performance Test. Colors and patterns as selected by Architect, maximum five (5) colors may be selected by Architect. Undersides of countertops and splashes shall be laminated with standard .020" phenolic balance sheet.

- C. Unless otherwise noted, all exposed edges of countertop and splash shall be edged, full thickness, with 3 mm PVC edging applied with hot glue.
- D. Sinks: Provide cutouts for sinks as required. Coordinate with Division 15. Seal cut edges of particleboard countertop with acrylic latex caulking.
- E. Electrical Devices: Provide for and coordinate with Division 16.
- F. Joints: Secure joints in countertops with glue, biscuits, and mechanical fasteners.
- G. Finish: Where wood is detailed as the exposed finish material on counter-top edges, it shall be Shop Finished to specifications no less than that called out for painted or stained wood in Section 09 91 00.

2.05 STEEL COUNTERTOP SUPPORTS

Provide steel tube supports and angles as indicated on drawings, see Section 05 50 00.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify spaces are ready to receive casework and shelving. Verify grounds, blocking, and supports are at proper location for adequate support of casework and shelving. Report any unsatisfactory conditions to the Contractor in writing with copy to Architect.
- B. Beginning of installation means acceptance of existing conditions by installer.

3.02 PREPARATION

Field measure spaces to receive casework prior to commencement of fabrication.

3.03 INSTALLATION

- A. General: Set casework accurately in place, level, and secure to floor and walls. Provide connecting and attaching devices, closures, and trim members as required. Closures or fillers for wall cabinets shall include fillers at the cabinet top and bottom as well as the cabinet face. Install items complete. Scribe and closely fit casework to adjacent work. Fasten base cabinets securely to base and to floor.
- B. Rubber Base: Provided under Section 09 65 00.
- C. Sinks, Trim, and Electrical Devices: Provided under Divisions 23 and 26.

3.04 ADJUSTING AND CLEANING

- A. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Repair or remove and replace defective work as directed by Architect upon completion of installation.
- C. Clean plastic faced surfaces. Repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
- D. Protection: Advise Contractor of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the Owner.

END OF SECTION

Not for Construction

SECTION 12 48 13.13 FLOOR MAT TILES

PART 1 - GENERAL

1.01 SUMMARY

Section Includes: Entry floor mat tiles.

1.02 SUBMITTALS

- A. Shop Drawings: Submit shop drawings for floor mat tiles in accordance with Sections 01 33 00 and 01 33 23. Shop drawings shall indicate layout of floor mat tiles and perimeter transition details.
- B. Product Data: Submit product data for floor mat tiles in accordance with Sections 01 33 00 and 01 33 23.
- C. Color Samples: Submit complete set of samples for Architect's color selection.

PART 2 - PRODUCTS

2.01 FLOOR MAT TILES

- A. Acceptable Manufacturers:
 - 1. Collins & Aikman
 - 2. Mats, Inc.
 - 3. or approved substitute
- B. Manufacturer and Type: Collins & Aikman "Abrasive Action II", or equivalent of other acceptable manufacturer,
 - 1. 6' wide roll goods, Powerbond backing
 - 2. 100% recycled content backing

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Entry Floor Mat
 - 1. Install in strict accordance with manufacturer's recommendation.
 - 2. Locate mat joints only where indicated on approved shop drawings.
 - 3. Install floor mats only after building has been cleaned.
- B. Install continuous reducer / transition where floor mat and other floor covering materials meet.

END OF SECTION

SECTION 220010 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provisions of the General Conditions and Division 1 – General Requirements, and applicable provisions elsewhere in the Contract Documents apply to the work of Division 22 Plumbing.
- B. Work Included:
 - 1. Include all labor, materials, equipment, and incidental items necessary to complete the work shown, specified and as may be otherwise required for a complete, operational mechanical system.
 - 2. All work under this division shall be subject to all of the provisions of the Contract Documents.
 - 3. One prime Mechanical Subcontractor is to be responsible for all the work done under Division 22 of the Contract Documents, including his forces and lower tier Subcontractors.
- C. Description of Systems: Division 22 work includes, but is not limited to:
 - 1. Plumbing Systems
 - 2. Gas Systems
- D. References
 - 1. Equipment storage and substitutions – refer to Specification Division 1.
 - 2. Equipment submittals – refer to Specification Division 1.

1.2 CONTRACT DOCUMENT DISCREPANCIES

- A. The Plumbing Contractor shall review all drawings of Architectural, Civil, Structural, Electrical and Mechanical for any items to be included in the Plumbing Contractor's scope of work. Any conflicts, duplications or omissions noted between the mechanical division and any other division shall be brought to the attention of the Architect/Engineer for clarification prior to bid. Conflicts, duplications or omissions noted after the award of the contract shall be the responsibility of the Plumbing Contractor.
- B. In the event of conflicts or discrepancies between the Specifications and the Drawings, or within either document itself, the bid shall be based on the better quality equipment or greater quantity of work.
- C. No changes shall be made to the Contract Documents after award of the contract except those authorized in writing by the Architect/Engineer.

1.3 EXAMINATION OF THE SITE

- A. The plans have been prepared utilizing all available information and obtaining all other data that could reasonably be procured concerning the location of domestic water, storm, sanitary, waste and vent piping, and ductwork. Additional work under this section, caused by the lack of

information as to exact tie-ins, locations, or sizes will not be considered as a just cause for a claim for additional compensation. Any person contemplating doing work under this section of the Specifications shall visit the site of the work, and shall make himself thoroughly familiar with the existing mechanical system, and shall have a thorough understanding of the work to be done. No allowance will be made for insufficient knowledge of the existing site conditions or the scope of the work.

1.4 PLANS AND SPECIFICATIONS

- A. Design drawings are diagrammatic to show general design and routing, equipment capacities, arrangements, and extent of systems. They do not show exact sizes, locations, clearances and details for use with all manufacturer's equipment.
- B. Existing Utilities: Are indicated as accurately as possible on the Drawings. Work on utilities encountered and not indicated on the drawings will be directed by change order after being brought to the attention of the Architect/Engineer. Close openings and repair damage in acceptable manner to utilities encountered.
- C. Specifications give equipment quality and manufacturing details. Drawings provide capacity, size and acceptable brands. Equipment must meet all of these requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Job site documents: Maintain at the job site, one (1) record copy of the following:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed shop drawings
 - 5. Change orders
 - 6. Field test reports
- B. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible condition, apart from documents used for construction.
- C. Record Information: Label each document "RECORD DOCUMENT". Mark information in ink in a contrasting color, keeping each record current daily. Do not conceal any work until required information is recorded.
- D. Record the following information on the drawings:
 - 1. Location of underground utilities.
 - 2. Location of internal utilities and accessories concealed in construction.
 - 3. Field changes of dimension and detail.
 - 4. Changes by change or field order.
 - 5. Details not on original Contract Drawings.
- E. Record the following information on specifications:
 - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 - 2. Changes by change or field order.
 - 3. Other items not specified in original set of specifications.

- F. Shop Drawings: Maintain shop drawings as record documents, recording all changes made after the Architect/Engineer's shop drawing submittal review.
- G. Submittal: At completion of project, deliver Project Record Documents to General Contractor. Changes to drawings shall be updated electronically and delivered to General Contractor in AutoCAD format.

1.6 DIVISION OF RESPONSIBILITY

- A. Subdivisions, subparagraphs or drawing notes indicating a division in the Plumbing Contractor's work are for convenience and assistance only and are not in any way intended to delineate lines of responsibility between Subcontractors and suppliers. The division of such responsibility rests entirely with the Plumbing Contractor and he shall inform his Subcontractors and suppliers accordingly.

1.7 COORDINATION

- A. General: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.
- B. Coordination Drawings: Prepare ¼"=1'-0" scale shop drawings showing duct, piping, conduit, equipment, lights and all necessary items to assure coordination between this and other trades. These drawings are to be used for fabrication and installation; the Design Drawings are not to be used as shop drawings. Responsibility for successful coordination rests entirely with the Contractor. Coordination drawings shall be 3D, in congested areas with provision for collision check. The contractor is responsible for obtaining architectural, structural, mechanical, and plumbing drawings in 3D. All 3D drawing development, collision check, coordination, etc. shall be included as part of the Contractor's base bid.
- C. Installation Procedures: Confer and cooperate with other trades and coordinate the work in proper relation with theirs. Coordinate ceiling cavity space carefully with other trades.
- D. Utility Interruptions: Coordinate mechanical utility interruptions with the Owner and the Utility Company. Plan work so that duration of the interruption is kept to a minimum.
- E. Cutting and Patching:
 - 1. Contractor is responsible for the costs of cutting and patching for work under Division 22 caused by improper coordination or notification. Comply with the requirements of Division 1.
 - 2. Cutting: Coordinate and supervise cutting required. Notify Architect/Engineer before any cutting, channeling, chasing or drilling. Use rotary type drill or other method as approved by the Architect/Engineer. Holes cut with pneumatic hammer will not be accepted. Cutting of steel, wood or other main structural parts must be approved by Architect/Engineer prior to commencing cutting.
 - 3. Patching: Seal openings and repair and refinish any damage to building elements using skilled tradesmen in a manner acceptable to Architect/Engineer.
- F. Drawings and Specifications: The Drawings and Specifications are complimentary; what is called for in either of these is binding as though called for by both. The Plumbing Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do

not scale Drawings for dimensions. Take dimensions, measurements, locations, levels, etc., from the Architectural Drawings and equipment to be furnished. No extra compensation will be allowed on account of difference between actual dimensions and those indicated on the Drawings.

G. Discrepancies:

1. Review all Drawings and Specifications of Architectural, Electrical, Structural, and Mechanical for any items to be included by the Plumbing Contractor. Any conflicts, duplications or omissions noted between the Plumbing Division and other divisions prior to the bid shall be brought to the attention of the Architect/Engineer for clarification. Any conflicts, duplications or omissions noted after award of the contract shall be the responsibility of the Plumbing Contractor.
2. Make any changes, at no additional cost to the Owner, to the work of Division 22 made necessary by the failure or neglect to report such conflicts, duplications or omissions. However, it is not the intent of the Specifications that the Contractor be responsible for the correct design of the mechanical systems.

H. Order of Precedence: The precedence of plumbing Construction Documents is as follows:

1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
2. Should there be a conflict within the Specifications or Drawings of the same scale, the more stringent or high quality requirements shall apply.
3. In the Drawings, the precedence shall be drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions, and noted materials over graphic indications.
4. Should there be a conflict between Drawings and Specifications, the Drawings shall have precedence.
5. Should there be a conflict in dimensions or locations between Plumbing Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.8 PLUMBING/ELECTRICAL COORDINATION

- A. Check and review the Electrical Drawings and Specifications to ensure coordination with Division 26. Any errors and/or omissions noted between Divisions 22 and 26 shall be brought to the attention of the Architect/Engineer for his decision.
- B. It shall be the responsibility of the Plumbing Contractor to transmit to the General Contractor prior to starting any work, all changes of electrical characteristics which result from any substitution of equipment. Any and all charges for such changes shall be the responsibility of the Plumbing Contractor.
- C. Equipment and labor shall be furnished in accordance with the following schedule:

Item	Div. Furnished By	Div. Set/ Mounted by	Div. Wired/ Connected by
Equipment Motors	22	22	26*
Motor controllers, magnetic starters, manual 3-phase starters, reduced voltage starters, etc Factory mounted	22	22	26
Provided separately	26	26	26
Disconnect switches, thermal overload switches, toggle disconnect switches	26	26	26
Push buttons and pilot lights	22	22	22
H-O-A switches	22	22	22
Temperature controls, control relays, time clocks serving Plumbing equip., control transformers, control panels, solenoid valves	22	22	22
Heat Tracing	22	26	26
Motor valves	22	22	22
Interlocks	22	22	
Variable frequency drives	22	22	26*
** Div. 26 wires through VFD to motors			

1.9 REGULATORY REQUIREMENTS

- A. Contractor shall pay for all permits, inspections, certificates, water tap fees and sewer connection costs applicable to work under Division 22. Water and wastewater development charges and water distribution facility charges are the obligation of the Owner and will be paid by the Owner, including main line recovery charges, if any.
- B. Contractor shall comply with all applicable local and state code requirements and ordinances. Comply with all requirements of utility companies. Call for inspections by local building inspection authority. Applicable codes and ordinances include, but are not limited to, the following:
 1. International Building Code, 2009 Edition
 2. International Plumbing Code, 2012 Edition
 3. International Mechanical Code, 2009 Edition
 4. International Existing Building Code, 2009
 5. Governing Fire Department Requirements
 6. Utility Company Requirements
 7. State of Colorado Energy Requirements
 8. State Department of Labor Requirements
 9. State Department of Health Requirements
 10. National Fire Protection Association Standards and Codes - NFPA
 11. State and Federal Safety and Health Laws
 12. National Electrical Code 2014

- C. Discrepancies: If discrepancies occur between these Specifications, local codes, local utility requirements, etc., the most stringent requirements or greater quantity of work shall apply.
- D. Where fire or smoke ratings are indicated or required, provide components and assemblies meeting the requirements of the International Building Code, the NFPA and listed by Underwriters' Laboratories, Inc.

1.10 TEMPORARY HEATING

- A. Permanent heating system and equipment shall not be used for temporary building heat during construction, unless written authorization is obtained from the Owner.

1.11 DAMAGED WORK

- A. Remove, reconstruct, refinish or otherwise make acceptable to the Architect/Engineer, work damaged after installation. No extra time extension or monetary compensation will be given for faulty or damaged work.

1.12 ADVERSE WEATHER CONDITIONS

- A. Execute no work under conditions unsuited to proper execution, safety, and permanence. Architect/Engineer's decision in cases of controversy shall be final.

1.13 PROTECTION AGAINST WATER

- A. Keep work dry at all times. Protect all equipment, piping, duct, insulation, etc. from damage due to water while in storage, during installation, and after installation. If dewatering is necessary, provide all equipment required and discharge water in a location where no drainage injury or damage can occur.

1.14 INSPECTIONS

- A. Notify the Architect/Engineer with minimum 48 hours notice when the following inspections are to be performed by the Engineer:
 - 1. First Inspection:
 - a. When all pipes to be concealed are complete and ready for such pressure, leak and other tests as required.
 - b. This inspection will be conducted after all system leaks have been discovered and corrected, and while system is under test, before any equipment or system component is concealed.
 - 2. Second Inspection:
 - a. When all equipment is in place, but prior to operation of any equipment.
 - 3. Third Inspection:

- a. When system is ready to be turned over to Owner, complete and satisfactorily operating in accordance with the Drawings, Specifications and Change Orders.
 - B. Upon notice from Contractor certifying that the work is ready for inspection, Engineer will prepare punchlist of items determined to be incomplete or otherwise not in compliance with the intent of the Contract Documents.
 - C. Contractor shall pay Engineer's costs at the billing rates in effect at the time the services are performed for subsequent punch list visits required due to lack of completion of prior punch list, or if it is determined that the project work is not completed and ready for the requested inspection.
 - D. Contractor shall call for all inspections from the local building department as required by the Authority Having Jurisdiction. Contractor is responsible to call for inspections in a timely manner in order to maintain project schedule.
 - E. Where required, all equipment falling under State Department of Labor Regulations shall be inspected by them. Contractor is responsible to call for these inspections in a timely manner in order to maintain project schedule.
- 1.15 OPERATING AND MAINTENANCE DATA
- A. General: Comply with Division 1.
 - B. Submission: Submit six (6) 8-1/2 x 11" typed and bound copies of operating and maintenance manuals to the Architect/Engineer for approval prior to scheduling any system demonstration or training for the Owner.
 - C. Contents: Manuals shall have index with tab dividers for each major equipment section to facilitate locating information on a specific piece of equipment. Identify data within each section with equipment markings as they appear in the Drawings and Specifications. Include as a minimum the following data:
 - 1. List of system components, in alphabetical order, with company name, contact person, address and 24 hour phone number of the company responsible for servicing the equipment during the first year of operation.
 - 2. Operating instructions for the complete system including:
 - a. Emergency procedures for failure of major equipment or fire.
 - b. Major equipment operations, including startup, shutdown, normal operation and emergency equipment shutdown.
 - 3. Maintenance instructions, including:
 - a. Valve tags and other identified equipment lists.
 - b. Proper lubricants and lubricating instructions for each piece of equipment.
 - c. Necessary cleaning, replacement and/or adjustment schedule.
 - 4. Product data on each piece of equipment, including:
 - a. Installation instructions.
 - b. Drawings and specifications.
 - c. Parts lists.
 - d. Complete wiring and temperature control diagrams (as-built).

- e. Marked or changed drawings indicating locations of concealed components and variations from the original system design.
5. Schematic floor diagrams indicating equipment locations, including valves in the systems. Valves shall be numbered for easy identification by owner.
6. Simplified description of each system and preventative maintenance program.
7. All start-up cards for equipment.

1.16 CERTIFICATES AND GUARANTEE

- A. Warranty: In accordance with Division 1, provide a written warranty to the Owner covering the entire mechanical work to be free from defective materials, equipment and workmanship for a period of one (1) year from Date of Acceptance. Provide labor and materials as required during this period to repair or replace defects and pay for any damage to other work resulting therefrom, at no additional cost to the Owner. Provide certificates for such items of equipment which have warranties in excess of one (1) year. All freight shall be prepaid on warranty items. Submit warranty to the General Contractor for delivery to the Owner.
- B. This warranty will be superseded by the terms of any specific equipment warranties or warranty modifications resulting from use of equipment for construction. This warranty may be voided by improper Owner maintenance practices.

1.17 CERTIFICATES AND KEYS

- A. Certificates: Upon completion of work, secure three (3) copies of all certificates from any state or local Authority Having Jurisdiction indicating that the work is in strict accordance with the applicable codes and submit the certificates to the General Contractor for delivery to the Owner.
- B. Keys: Upon completion of work, submit all keys for mechanical equipment, panels, equipment rooms, etc. to the General Contractor for delivery to the Owner.

1.18 CONTRACTOR'S QUALIFICATIONS

- A. The plumbing contractor and all subcontractors shall have installed a minimum of three (3) projects similar in scope, system type, and total construction cost in the past three years. References confirming the above shall be disclosed to the Owner and Architect/Engineer upon request.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. Bidders shall quote on brands and manufacturers of equipment as requested in these Specifications and Drawings. See appropriate section of the Contract Documents for requirements governing the prior approval process.
- B. Submittals from subcontractors and equipment suppliers are to be carefully checked by the Contractor for space requirements and conformance to the Drawings and Specifications. These submittals shall be so noted by the Contractor prior to forwarding to the Architect/Engineer for checking. No deviations from the Drawings and Specifications will be allowed, recognized or

considered unless brought to the attention of the Architect/Engineer at the time the submittals are submitted by the Contractor. Submittals not processed by the Contractor before forwarding to the Architect/Engineer for approval will be returned to the Contractor for his prior processing.

- C. Submittals shall include catalog cut-sheets, written descriptions, and specification sheets detailing the associated product, item and assembly.
- D. No substitution for brands named in the Contract Documents will be considered unless written request has been submitted to the Engineer. Each such request shall include a complete description of the proposed substitute, drawings, cut sheets, performance and test data, and any other data or information necessary for complete evaluation. The burden of proving acceptability of a proposed product rests on the party submitting the request for approval. Request for product approval substitutions shall be submitted in writing to the Engineer a minimum of ten (10) working days in advance of the bid date.
- E. Shop drawings shall include details, installation drawings, assembly drawings, fabrication drawings, diagrams, and other information which show adaptation or installation of Contractor-furnished products or materials for overall project.
- F. The purpose of submittals and shop drawings is to ensure Contractor understands design requirements and demonstrates understanding by indicating and detailing intended materials, methods, and installation practices. Submittals and shop drawings are not a method of requesting substitutions or deviation from Specifications. If discrepancies between submittals, shop drawings, and Contract Documents are discovered either prior to or after submittals and shop drawings are reviewed, requirements of Contract Documents shall take precedence.
- G. Each major submittal section (HVAC, plumbing, fire protection) shall be submitted at the same time, with the exception of the energy management system, which may be submitted separately from the HVAC submittal.
- H. In the front of each submittal, the Plumbing Contractor shall include a signed letter from the project Electrical Contractor indicating that the Electrical Contractor has reviewed the plumbing submittals and has verified that the equipment being submitted will conform to the design of the project electrical systems.
- I. After Architect/Engineer review, submittals and shop drawings will be returned together with Submittal Review Sheet which indicates comments on submittals and shop drawings and with specific actions such as "No Exception Taken", "Make Corrections Noted", "Rejected", and "Resubmit". Continue to resubmit submittals and shop drawings until "No Exception Taken" or "Make Corrections Noted-Resubmittal Not Required" action is indicated.
- J. Shop drawings shall be submitted for each of the following items as applicable:
 - 1. Controls & Control Diagrams including Wiring Plans
 - 2. Pipe Insulation & Accessories
 - 3. Pipe and Pipe Fittings
 - 4. Pipe Identification Systems
 - 5. Pressure Reducing Valves
 - 6. Relief Valves
 - 7. Pipe Hangers, Supports & Accessories
 - 8. Pipe Accessories
 - 9. Backflow Preventers
 - 10. Manholes and Accessories
 - 11. Plumbing Fixtures & Fittings
 - 12. Water Heaters and Boilers & Accessories

13. Valves & Unions
14. Cleanouts & Accessories
15. Shock Arrestors
16. Access Covers & Panels
17. Valve Schedules and Diagrams
18. Wall Hydrants & NFWH's
19. Floor Drains
20. Gauges
21. Gas Pressure Regulators

2.2 DELIVERY, STORAGE AND HANDLING

A. General:

1. Comply with Specification Division 1.
2. Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer name, trade name, type, class, grade, size and color.

B. Protection: Store materials and equipment off of the ground and under cover, protected from damage. Exercise care to prevent damage to materials during loading, transporting and unloading.

C. Large items: Make arrangements with other project contractors for moving equipment that is too large to pass through finished openings into the building.

D. Acceptance: Check and sign for materials to be furnished by others for installation under Division 22 upon delivery. Assume responsibility for the storage and safekeeping of such materials from time of delivery until final acceptance.

PART 3 - EXECUTION

3.1 INTENT

- A. All drawings, specifications and details shown or noted are to indicate design and required results, and shall be followed in spirit and intent as well as to the letter.
- B. Provide satisfactory, complete installation in accordance with the intent of the drawings and specifications, including incidental items required even though not particularly specified or indicated.
- C. Should a specific Contractor or supplier require other or additional work or materials to obtain the required results or test, the Contractor shall furnish such work or materials as part of his contract at no additional cost to the owner.

3.2 LICENSING:

- A. Plumbing work shall be performed under the direct supervision of a commercially licensed plumbing contractor, licensed in the state where the work is being performed.

3.3 INSTALLATION

- A. Execute work such that all components function together as a complete, workable system. Make slight alterations necessary to make adjustable parts fit with fixed parts. Execute work to contribute to efficiency of operation, accessibility, sightlines, and minimum maintenance clearances. Leave equipment properly adjusted and in working order.
- B. Verify dimensions indicated and report any error or inconsistency before commencing work.
- C. Coordinate work with other trades through the General Contractor so that equipment, especially in the ceiling, will fit to patterns of finished materials, and locate all elements to carry harmony of architectural design throughout the building. Coordinate work with other trades to avoid conflicts, especially in places where close, careful fitting is required. Coordination problems and field solutions must be approved through the General Contractor and the Architect/Engineer before proceeding with work.
- D. Conform and accommodate systems to the building structure, equipment and usage so that they do not interfere with the operation of any other system or operational part of the building.
- E. Preparation: Final installation of materials and equipment shall be based on actual dimensions and conditions at the job site. Field measure for materials or equipment requiring exact fit.
- F. Workmanship: Perform work in accordance with good commercial practice and all applicable trade standards. The finished appearance of the work shall be of equal importance with its mechanical efficiency.
- G. Clearances: The Subcontractors working under this Division shall be responsible for the sufficiency of the size of shafts and chases, and clearances in double partitions and hung ceilings for proper equipment installation. Cooperate with Contractors of other Divisions whose work is in the same space and advise the General Contractor of requirements. Such spaces and clearances shall be kept to the minimum size required.
- H. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, shock absorbers, traps, cleanouts, motors, controllers, switchgear, drain points, manual dampers, and smoke and fire dampers. If required for accessibility, the Contractor shall furnish access doors for this purpose, subject to the following:
 - 1. Access door shall be sized to permit removal of equipment, or 24"x24" if used for service only.
 - 2. Furnish doors to trades performing work in which they are to be installed. Group valves, devices and other equipment to permit use of minimum number of access doors.
 - 3. Doors shall be lockable and suitable for painting to match adjacent finishes.
- I. Minor deviations from the Drawings may be allowed to provide for better equipment accessibility. The General Contractor shall approve of any change prior to this Contractor making the change.
- J. Properly locate anchors, chases, recesses and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc., and for the leaving of the required chases, recesses and openings in sufficient time to be installed in the normal course of work. Install equipment and materials in accordance with manufacturer recommendations unless specifically indicated otherwise, or where local codes or regulations take precedence. This includes the performance of tests the manufacturer recommends. It is intended that anything, whether labor or materials, which is usually furnished as a part of any equipment

specified and which is necessary for the best operation shall be furnished as a part of the contract without additional cost, whether or not shown or described.

- K. Testing: See individual Specification sections in Division 22 for testing of plumbing work.
- L. Protection: Cover and seal ends of pipe during construction to prevent entry of foreign material and moisture. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during plumbing work.
- M. Freeze Protection: Do not run piping in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection. Water piping exposed to freezing conditions shall be insulated as specified, with aluminum weather jacket and electric heating cable, thermostatically controlled, as specified under section 22 0533. Heat tracing shall be coordinated with Electrical Contractor and installed on all exterior water piping, per applicable Division 22 and 26 Specifications.
- N. Scaffolding, Rigging and Hoisting: Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required.
- O. Materials and apparatus required for the work to be new, of first-class quality, and to be furnished, delivered, installed, connected and finished in every detail. Equipment shall be selected and arranged such that it fits properly into the building space provided. Where no specific kind or quality of material is given, a first-class standard article shall be furnished.
- P. Equipment start-up and adjustment of all equipment shall be performed by certified factory representatives of the respective equipment manufacturer.
- Q. Furnish the services of an experienced superintendent, who will be constantly in charge of installation of the work, together with all skilled tradesmen, fitters, helpers and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.

3.4 THROUGH PENETRATIONS

- A. References:
 - 1. ASTM E 814: Standard Test Methods for Fire Tests of Through-Penetration Firestops.
 - 2. UL 1479 Standard for Fire Tests of Through-Penetration Firestops, including optional air leakage test.
- B. Non-Rated Walls
 - 1. All penetrations through concrete or masonry walls shall be sleeved with a steel standard weight pipe sleeve which shall be grouted in place. Closures shall be provided between the pipe and sleeve wherever an exterior wall or is penetrated. Use Link-Seal modular rubber seals as manufactured by Thunderline Corp., Wayne, Michigan.
- C. Fire Resistance Rated Assemblies
 - 1. Performance Requirements

- a. Penetrations: Provide through-penetration firestop systems that are installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.
 - 1) Install complete through penetration firestop systems that have been tested and are listed by recognized testing agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of site conditions.
 - 2) F-Rated Systems: Install through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than the fire resistance rating of the assembly being penetrated.
 - 3) T-Rated Systems: Install through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the Building Code.
 - 4) L-Rated Systems: Install through-penetration firestop systems with L-ratings as determined by UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.
 - 5) W-Rated Systems: Install through-penetration firestop systems meeting W-Rating Class 1 Requirements as determined by the UL Water Leakage Test for systems tested and listed in accordance with UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.
 - 6) For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 7) For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2. Schedules

- a. Unless otherwise noted on the drawings. Provide the fire stop systems or their approved equal as listed below:
 - 1) Metallic Pipe, Metallic Ductwork, Non-Metallic Pipe smaller than 2".
 - 2) 3M Fire Barrier Sealant CP 25WB+:
 - 3) Material Description: Intumescent latex/water based caulk
 - 4) Formulation: No-sag, non-halogen formula. Fast drying. Paintable
 - 5) Water Resistance: Provide water resistant seal
 - 6) Non-Metallic Pipe 2"-4"
 - 7) 3M Fire Barrier FS-195+ Wrap/Strip with 3M Fire Barrier RC-1 Restricting Collar:
 - 8) FS-195+ Material Description: One-part, organic/inorganic intumescent elastomeric strip with foil on one side.

3. Installation of Through-Penetration Firestop Systems

a. General

- 1) Install through-penetration firestop systems to comply with "Performance Requirements" above and firestop systems manufacturer's written installation instructions and published drawings for products and applications indicated.
- 2) Install forming/damming/backing materials and other accessories of types required to support fill material during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.
- 3) Install fill materials for firestop systems by proven techniques to produce the following results:
- 4) Fill voids and cavities formed by openings, forming materials, accessories and penetrating items as required to achieve the fire-resistance ratings indicated.

5) Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

- b. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining surfaces.
- c. Watertight. Meets UL Water Leakage Test - Class 1 requirements for systems tested and listed in accordance with the criteria of ASTM E 814 (UL 1479) Standard Test Method for Fire Tests of Through-Penetration Fire Stops. W Rating - Class 1 requirements include a minimum water column exposure of 3 ft. for 72 hours prior to the standard time / temperature curve for the fire test.

4. Field Quality Control

- a. Proceed with enclosing through-penetration firestop systems with other construction only after inspection and approval by Authority Having Jurisdiction.
- b. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 EXCAVATING AND BACKFILLING

- A. All underground utilities shall be located and marked prior to excavating. Contractor shall instruct and train employees on markings, color codes, and excavation and safety procedures for natural gas lines. When excavation approaches gas lines, expose lines by carefully probing and hand digging.
- B. Perform excavation and backfilling per Division 31, and in strict accordance with the latest OSHA regulations. Sheeting, bracing, barricades, fencing and trench wall supports shall be provided wherever necessary to prevent injury to Contractor personnel or passersby.
- C. Trench walls shall be a minimum of 6" from each side of mechanical piping being installed. Install adjacent pipes with minimum of 6" clearance between when located in same trench.
- D. Do not backfill until work has been inspected, tested and approved. Backfill material shall be approved by Architect/Engineer. Do not bury lumber, metal or other debris with backfill.
- E. Repair any damage to finished surfaces.

3.6 CLEANING

- A. Cleaning During Construction and Final Cleaning: Comply with General Requirements.
- B. Clean exposed surfaces of piping, hangers, and other exposed items of grease, dirt or other foreign material. Clean and polish plumbing fixtures, fittings, and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove labels from exposed equipment. Carefully and thoroughly clean all items of equipment. If finishes have been damaged, refinish to original condition using factory-provided matching paint, and leave all equipment in proper working order and intended appearance. At the completion of the work, remove all rubbish, cleaning supplies and debris resulting from the operation and leave spaces clean and ready to use.
- C. Flush all piping systems free of foreign substances before installing valves or making final connections. Notify the Owner seven (7) days in advance of final flushing so that Owner may attend and verify the cleanliness of the pipe.

3.7 PLUMBING SERVICE AND MAINTENANCE

- A. Include four (4) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout one (1) year warranty period. During each maintenance call, technicians shall:
1. Verify proper working order of safety devices on each piece of equipment.
 2. Check lubrication of all moving parts and lubricate as necessary.

3.8 EXISTING PLUMBING OPERATIONS

- A. General: Coordinate with the Owner's authorized representative prior to any operations which may affect the normal operations of the Owner. Obtain written authorization from the Owner's representative before commencing operations in an area in which the work could reasonably be expected to cause undue inconvenience to or interrupt normal operations of the Owner.
- B. Provide protection to prevent damage or interference to existing utilities. In the event of accidental interruption of a service or utility, inform General Contractor, Owner, and related utility company without delay, and take prompt remedial action.
1. Schedule work requiring disconnecting, reconnecting, and interruption of services and utilities with General Contractor, Owner and utility companies.
 2. Maintain electrical and mechanical services and utilities unless interruptions are scheduled.
 3. Provide and remove temporary connections when no longer required.
- C. Relocation of Services: Active piping, electrical and/or telephone systems which are not indicated on the drawings which would interfere with or hinder the progress of the work shall be relocated by the Contractor at no additional cost.
- D. Conditions for Interconnection and Modification: Carefully schedule and coordinate all work with an authorized representative of the Owner. Contractor shall have all of his major equipment and associated materials in his possession and prefabricated to the extent necessary before starting any work which will cause the Owner to be without plumbing and/or electrical services. Upon starting such work which will result in outage of mechanical or electrical services, the Contractor shall proceed without delay to reinstate services by quick and deliberate performance of the appropriate work. Contractor shall consider that weekend and overtime work will be necessary to install and connect new equipment.

3.9 EXISTING SYSTEM MODIFICATIONS

- A. Modifications to the existing plumbing systems and associated structural and electrical components shall be provided as indicated and as necessary to accomplish the work of this division. Modifications shall include the removal of piping, equipment and components, relocation of components, termination and relocation of utilities, cutting, patching, cleaning, adjusting and refinishing, and all incidental work related to these tasks.
- B. No cutting shall be done to structural members unless indicated, or unless specific approval is obtained from the Architect/Engineer.
- C. Cutting shall be done neatly to allow satisfactory patching that will blend with adjacent surfaces. Unless otherwise approved, rotary saws shall be used that ensure cutting concrete, asphalt, masonry, walls, ceilings, etc. in a straight line.

- D. Patching shall be completed in accordance with the appropriate section of these Specifications if such section exists. If no such section covering materials and procedures exists, patchwork shall be accomplished with materials most similar to the existing, and with such procedures as may be necessary to match the existing work. Each Subcontractor shall be responsible for cutting and patching required for their trade.

3.10 DEMOLITION

- A. Contractor shall demolish and remove portions of piping and equipment as shown and as necessary to add the new equipment indicated. Maintain existing connections to downstream devices affected by demolition. Existing equipment to be removed shall first be offered to the Owner for his use, and if rejected by the Owner, shall become the property of the Contractor and removed from the site.

END OF SECTION 220010

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. 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. Plumbing demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 2. CPVC: Chlorinated polyvinyl chloride plastic.
 3. PE: Polyethylene plastic.
 4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 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 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.

1.6 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.

1.7 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. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 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.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. 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.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.

2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Available Manufacturers:

- a. Cascade Waterworks Mfg. Co.
- b. Dresser Industries, Inc.; DMD Div.
- c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
- d. JCM Industries.
- e. Smith-Blair, Inc.
- f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

- a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

- a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Available Manufacturers:

- a. NIBCO INC.
- b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Available Manufacturers:

- a. Cascade Waterworks Mfg. Co.
- b. Fernco, Inc.
- c. Mission Rubber Company.
- d. Plastic Oddities, Inc.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 1. Available Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 1. Available Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 1. Available Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 2. 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 Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 1. Available Manufacturers:

- a. Calpico, Inc.
- b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psi minimum working pressure at 225 deg F.

1. Available Manufacturers:

- a. Perfection Corp.
- b. Precision Plumbing Products, Inc.
- c. Sioux Chief Manufacturing Co., Inc.
- d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:

- a. Advance Products & Systems, Inc.
- b. Calpico, Inc.
- c. Metraflex Co.
- d. Pipeline Seal and Insulator, Inc.

- 2. Sealing Elements: EPDM/NBR Insert other interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- 3. Pressure Plates: Plastic. Include two for each sealing element.
- 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. 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.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

- 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.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With set screwspring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, 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

3.1 PLUMBING DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.
 - 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.

3.2 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. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
 - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - i. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
 - j. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 - 2. Existing Piping: Use the following:

- a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated rough-brass finish.
 - f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
1. 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. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. PVC/Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

- R. **Underground, Exterior-Wall Pipe Penetrations:** Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. **Mechanical Sleeve Seal Installation:** Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. **Fire-Barrier Penetrations:** Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 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 lead-free 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. **Flanged Joints:** Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. **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. **ABS Piping:** Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. **CPVC Piping:** Join according to ASTM D 2846/D 2846M Appendix.

4. 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.
 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. 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.

3.5 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.

3.6 PAINTING

- A. Painting of plumbing systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 7. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.10 GROUTING

- A. Mix and install grout for plumbing 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 220500

Not for Construction

SECTION 22 0513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single phase electric motors.
- B. Three phase electric motors.

1.02 RELATED REQUIREMENTS

- A. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 2015.
- B. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2014.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- D. Operation Data: Include instructions for safe operating procedures.
- E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for mechanical system use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Conform to NFPA 70.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Section 26 2717 for required electrical characteristics.
- B. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 40 degrees C environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

- C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- D. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Breakdown Torque: Approximately 200 percent of full load torque.
- B. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- C. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Multiple Speed: Through tapped windings.
- B. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Breakdown Torque: Approximately 250 percent of full load torque.
- B. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- C. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- D. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.06 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
- B. Insulation System: NEMA Class B or better.
- C. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- D. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- E. Sound Power Levels: To NEMA MG 1.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe Markers.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Heat Transfer Equipment: Nameplates.
- E. Instrumentation: Tags.
- F. Major Control Components: Nameplates.
- G. Piping: Tags.
- H. Pumps: Nameplates.
- I. Relays: Tags.
- J. Small-sized Equipment: Tags.
- K. Tanks: Nameplates.
- L. Thermostats: Nameplates.
- M. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch (6 mm).
 - 3. Background Color: Black.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

- A. Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mil (0.10 mm) thick, manufactured for direct burial service.
- E. Color code as follows:
 - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
 - 2. Fire Quenching Fluids: Red with white letters.

2.05 CEILING TACKS

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
- B. Color code as follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers and Smoke Dampers: Red.
 - 3. Plumbing Valves: Green.
 - 4. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9000 - Painting and Coating: Painting insulation jacket.
- C. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.
- D. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.
- E. Section 23 2213 - Steam and Condensate Heating Piping: Placement of hangers and hanger inserts.
- F. Section 23 2300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2013.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2013.
- F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.
- G. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.
- H. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2010.
- I. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.
- K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
- L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation; www.certainteed.com.
 - 2. Johns Manville Corporation; www.jm.com.
 - 3. Knauf Insulation; www.knaufusa.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. 'K' ('Ksi') value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum service temperature: 850 degrees F (454 degrees C).
 - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.03 CELLULAR GLASS

- A. Insulation: ASTM C552, Type II.
 - 1. Apparent Thermal Conductivity; 'K' ('Ksi') value: Grade 6, 0.35 at 100 degrees F (0.050 at 38 degrees C).
 - 2. Service Temperature: Up to 800 degrees F (427 degrees C).
 - 3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m).
 - 4. Water Absorption: 0.5 percent by volume, maximum.

2.04 HYDROUS CALCIUM SILICATE

- A. Insulation: ASTM C533 and ASTM C795; rigid molded, asbestos free, gold color.
 - 1. 'K' ('Ksi') value: ASTM C177 and C518; 0.40 at 300 degrees F (0.057 at 149 degrees C), when tested in accordance with ASTM C177 or ASTM C518.
 - 2. Maximum service temperature: 1200 degrees F (649 degrees C).
 - 3. Density: 15 lb/cu ft (240 kg/cu m).
- B. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

2.05 JACKETS

- A. PVC Plastic.
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
 - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
 - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.

- d. Thickness: 10 mil (0.25 mm).
- e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
 - 1. Thickness: 0.016 inch (0.40 mm) sheet.
 - 2. Finish: Smooth.
 - 3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 - 5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with PVC jacket and fitting covers.

- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- M. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Hot Water Supply:
 - a. Glass Fiber Insulation:
 - b. Cellular Glass Insulation:
 - 2. Domestic Hot Water Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All sizes.
 - 2) Thickness: 1 inch (25 mm).
 - 3. Domestic Cold Water:
 - 4. Plumbing Vents Within 10 Feet (3 Meters) of the Exterior:
- B. Other Systems:
 - 1. Piping Exposed to Freezing with Heat Tracing:
 - a. Glass Fiber Insulation
 - b. Thickness: 1 inch

END OF SECTION

SECTION 22 1005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Flanges, unions, and couplings.
 - 4. Pipe hangers and supports.
 - 5. Valves.
 - 6. Flow controls.
 - 7. Check.
 - 8. Water pressure reducing valves.
 - 9. Strainers.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 08 3100 - Access Doors and Panels.
- C. Section 09 9123 - Interior Painting.
- D. Section 22 0516 - Expansion Fittings and Loops for Plumbing Piping.
- E. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- F. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2012 (ANSI B16.18).
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2013.
- C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2014 (ANSI/ASME B31.9).
- D. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; The American Society of Sanitary Engineering; 2009.
- E. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013a.
- F. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- G. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2010.
- H. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2011.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
- K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.
- L. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
- M. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
- N. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- O. AWWA C550 - Protective Interior Coatings for Valves and Hydrants; American Water Works Association; 2013.

- P. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
 - Q. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2009.
 - R. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2011
 - S. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.
 - T. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.
 - U. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.
 - V. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - W. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - X. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - Y. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2013.
 - Z. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2011.
 - AA. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2010.
 - AB. NSF 61 - Drinking Water System Components - Health Effects; 2014.
 - AC. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- 1.04 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
 - B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
 - C. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.
 - D. Project Record Documents: Record actual locations of valves.
- 1.05 QUALITY ASSURANCE
- A. Perform work in accordance with applicable codes.
 - B. Valves: Manufacturer's name and pressure rating marked on valve body.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
 - B. Provide temporary protective coating on cast iron and steel valves.
 - C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 - D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.
- 1.07 FIELD CONDITIONS
- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.06 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, hard drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

2.07 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.

2.08 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
 - 1. Copper tube and pipe: Class 150 bronze unions with soldered joints.

2.09 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
 - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
 - 3. Wall Support for Pipe Sizes 2 Inches (50 mm) to 3 Inches (80 mm): Cast iron hook.
 - 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
 - 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

C. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

2.10 GATE VALVES

A. Manufacturers:

1. Conbraco Industries, Inc; www.apollovalves.com.
2. Nibco, Inc; www.nibco.com.
3. Milwaukee Valve Company; www.milwaukeevalve.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 3 Inches (80 mm):

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

2.11 GLOBE VALVES

A. Manufacturers:

1. Conbraco Industries, Inc; www.apollovalves.com.
2. Nibco, Inc; www.nibco.com.
3. Milwaukee Valve Company; www.milwaukeevalve.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Up To and Including 3 Inches (80 mm):

1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder ends.

2.12 BALL VALVES

A. Manufacturers:

1. Conbraco Industries, Inc; www.apollovalves.com.
2. Grinnell Products, a Tyco Business: www.grinnell.com.
3. Nibco, Inc; www.nibco.com.
4. Milwaukee Valve Company; www.milwaukeevalve.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.13 BUTTERFLY VALVES

A. Manufacturers:

1. Grinnell Products, a Tyco Business; B302: www.grinnell.com.
2. Hammond Valve; www.hammondvalve.com.
3. Crane Co.; www.cranecpe.com.
4. Milwaukee Valve Company; www.milwaukeevalve.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

- B. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches (150 mm) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

2.14 FLOW CONTROLS

- A. Manufacturers:
 - 1. ITT Bell & Gossett; www.bellgossett.com.
 - 2. Griswold Controls; www.griswoldcontrols.com.
 - 3. Taco, Inc; www.taco-hvac.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.15 SWING CHECK VALVES

- A. Manufacturers:
 - 1. Hammond Valve; www.hammondvalve.com.
 - 2. Nibco, Inc; www.nibco.com.
 - 3. Milwaukee Valve Company; www.milwaukeevalve.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Up to 2 Inches (50 mm):
 - 1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.
- C. Over 2 Inches (50 mm):
 - 1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged ends.

2.16 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches (50 mm):
 - 1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- B. Over 2 Inches (50 mm):
 - 1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.17 STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc; www.armstronginternational.com.
 - 2. WEAMCO; www.weamco.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
 - 1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
- G. Provide access where valves and fittings are not exposed.
 - 1. Coordinate size and location of access doors with Section 08 3100.
- H. Establish elevations of buried piping outside the building to ensure not less than 3 ft (1.1 m) of cover.
- I. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- J. Provide support for utility meters in accordance with requirements of utility companies.
- K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- L. Install bell and spigot pipe with bell end upstream.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Install water piping to ASME B31.9.
- O. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- P. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9.
 - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - 7. Support cast iron drainage piping at every joint.

3.04 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install globe valves for throttling, bypass, or manual flow control services.
- D. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

- A. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.

- B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

3.08 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
 - 1) Maximum hanger spacing: 6.5 ft (2 m).
 - 2) Hanger rod diameter: 3/8 inches (9 mm).
 - b. Pipe size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 3/8 inch (9 mm).
 - c. Pipe size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
 - 1) Maximum hanger spacing: 10 ft (3 m).
 - 2) Hanger rod diameter: 1/2 inch (13 mm).

END OF SECTION

Not for Construction

SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof and floor drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Backflow preventers.
- E. Water hammer arrestors.

1.02 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements: Procedures for [Owner]-supplied products.
- B. Section 22 1005 - Plumbing Piping.
- C. Section 22 4000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2009 (ANSI/ASSE 1012).
- C. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2011.
- D. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2011 (ANSI/ASSE 1019).
- E. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- F. NSF 372 - Drinking Water System Components - Lead Content; 2011.
- G. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2010.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers and water hammer arrestors.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Loose Keys for Outside Hose Bibbs: One.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company; www.jayrsmith.com.
 - 2. Josam Company; www.josam.com.
 - 3. Zurn Industries, Inc; www.zurn.com.
 - 4. Watts Drainage
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Floor Drain:

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company; www.jayrsmith.com.
 - 2. Josam Company; www.josam.com.
 - 3. Watts Drainage
 - 4. Zurn Industries, Inc; www.zurn.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- C. Cleanouts at Interior Finished Wall Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04 HOSE BIBBS

- A. Manufacturers:
 - 1. Woodford Manufacturing Company
 - 2. Jay R. Smith Manufacturing Company; www.jayrsmith.com.
 - 3. Watts Regulator Company; www.wattsregulator.com.
 - 4. Zurn Industries, Inc; www.zurn.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.05 HYDRANTS

- A. Manufacturers:
 - 1. Woodford Manufacturing Company
 - 2. Jay R. Smith Manufacturing Company; www.jayrsmith.com.
 - 3. Zurn Industries, Inc; www.zurn.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Hydrants:
 - 1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.06 REFRIGERATOR VALVE AND RECESSED BOX

- A. Box Manufacturers:
 - 1. IPS Corporation/Water-Tite; www.ipscorp.com.
 - 2. Oatey; www.oatey.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.07 DOUBLE CHECK VALVE ASSEMBLIES

- A. Manufacturers:
 - 1. Conbraco Industries; www.apollovalves.com.
 - 2. Watts Regulator Company; www.wattsregulator.com.
 - 3. Zurn Industries, Inc; www.zurn.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

B. Double Check Valve Assemblies:

1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.08 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company; www.jayrsmith.com.
2. Watts Regulator Company; www.wattsregulator.com.
3. Zurn Industries, Inc; www.zurn.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Water Hammer Arrestors:

1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets and flush valve fixture.

END OF SECTION

Not for Construction

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pumps.
 - 1. Circulators.
 - 2. Cooling Condensate Removal Pumps.

1.02 RELATED REQUIREMENTS

- A. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. ICC (IPC) - International Plumbing Code; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data:
 - 1. Indicate pump type, capacity, power requirements.
 - 2. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - 3. Provide electrical characteristics and connection requirements.
- C. Project Record Documents: Record actual locations of components.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.07 CERTIFICATIONS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 IN-LINE CIRCULATOR PUMPS

- A. Basis of design manufacturer, or:
 - 1. Armstrong Pumps Inc; www.armstrongpumps.com.

2. ITT Bell & Gossett; Model www.bellgossett.com.
3. Taco Inc., www.taco-hvac.com
4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Casing: Bronze, rated for 125 psig (860 kPa) working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

2.02 COOLING CONDENSATE REMOVAL PUMPS

- A. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.
- B. Safety: UL 778.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.
- C. Pumps:
 1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
 2. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches (100 mm) and over.
 3. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 3000 - Plumbing Equipment.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.
- D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- E. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2012.
- F. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures; 2013
- G. ASME A112.19.2 - Ceramic Plumbing Fixtures; The American Society of Mechanical Engineers; 2013.
- H. NSF 61 - Drinking Water System Components - Health Effects; 2012.
- I. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
- D. Manufacturer's Instructions: Indicate installation methods and procedures.
- E. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Flush Valve Service Kits: One for each type and size.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 WATER CLOSETS

- A. Water Closet Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Gerber Plumbing Fixtures LLC; www.gerberonline.com.
 3. Kohler Company; www.kohler.com.
 4. Zurn Industries, Inc; www.zurn.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, with elongated rim, with fittings and flush valve.
 1. Water Consumption: Maximum 1.6 gallon per flush.
- C. Seat Manufacturers:
 1. American Standard, Inc; www.americanstandard-us.com.
 2. Bemis Manufacturing Company; www.bemismfg.com.
 3. Church Seat Company; www.churchseats.com.
 4. Olsonite; www.olsonite.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- D. Flush Valves: ASME A112.18.1, diaphragm type, sensor-actuated, hard-wired at line voltage, complete with vacuum breaker stops and accessories.
 1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Sloan Valve Company; www.sloanvalve.com.
 - c. Zurn Industries, Inc; www.zurn.com.
 - d. Delta Commercial Faucets; www.deltacommercialfaucets.com
 3. Substitutions: See Section 01 6000 - Product Requirements.
- E. Seat: Solid white plastic, open front, extended back, less cover, complete with self-sustaining hinge.

2.03 WALL HUNG URINALS

- A. Wall Hung Urinal Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com.
 2. Gerber Plumbing Fixtures LLC; www.gerberonline.com.
 3. Kohler Company; www.kohler.com.
 4. Zurn Industries, Inc: www.zurn.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 1. Flush Volume: 0.5 gallon per flush, maximum.

2. Flush Valve: Exposed (top spud).
 3. Trap: Integral.
 4. Supply Size: 3/4 inch (19 mm).
- C. Flush Valves: ASME A112.18.1, diaphragm type, sensor-actuated, hard-wired at line voltage, complete with vacuum breaker stops and accessories.
1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com.
 - b. Sloan Valve Company; www.sloanvalve.com.
 - c. Zurn Industries, Inc; www.zurn.com.
 - d. Delta Commercial Faucets; www.deltacommercialfaucets.com
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- D. Carriers:
1. Manufacturers:
 - a. JOSAM Company; www.josam.com.
 - b. J.R. Smith
 - c. Zurn Industries, Inc; www.zurn.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

- A. Lavatory Manufacturers:
1. American Standard, Inc; www.americanstandard-us.com.
 2. Gerber Plumbing Fixtures LLC; www.gerberonline.com.
 3. Kohler Company; www.kohler.com.
 4. Zurn Industries, Inc; www.zurn.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Supply Faucet Manufacturers:
1. Delta Faucets
 2. American Standard, Inc: www.americanstandard-us.com.
 3. Kohler Company; www.kohler.com.
 4. Zurn Industries, Inc; www.zurn.com.
 5. Chicago Faucets, Inc.
 6. Substitutions: See Section 01 6000 - Product Requirements.
- C. Supply Faucet: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow) (1.9 liters per minute (low-flow)), with sensor-actuation, hard-wired at line voltage.
- D. Accessories:
1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
 2. Offset waste with perforated open strainer.
 3. Wheel handle stops.
 4. Rigid supplies.
 5. Carrier:
 - a. Manufacturers:
 - 1) JOSAM Company; www.josam.com.
 - 2) J.R. Smith
 - 3) Zurn Industries, Inc; www.zurn.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
 - b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.05 SINKS

- A. Sink Manufacturers:
 - 1. American Standard, Inc; www.americanstandard-us.com.
 - 2. Just Manufacturing
 - 3. Kohler Company; www.kohler.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Supply Faucet Manufacturers:
 - 1. Delta Faucets
 - 2. American Standard, Inc: www.americanstandard-us.com.
 - 3. Kohler Company; www.kohler.com.
 - 4. Zurn Industries, Inc; www.zurn.com.
 - 5. Chicago Faucets, Inc.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.

2.06 WATER COOLERS

- A. Electric Water Cooler Manufacturers:
 - 1. Tri Palm International/Oasis; www.tripalmint.com.
 - 2. Elkay Manufacturing Company; www.elkay.com.
 - 3. Haws Corporation; www.hawsc.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Drinking Fountain: Surface handicapped mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; with bottle filler.
 - 1. Electrical: 115 V, 60 Hertz to internal control transformer for bottle filler, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.08 SERVICE/MOP SINKS

- A. Service Sink Manufacturers:
 - 1. American Standard, Inc; www.americanstandard-us.com.
 - 2. Commercial Enameling Company; www.cecosinks.com.
 - 3. Elkay Manufacturing Company; www.elkay.com.
 - 4. Gerber Plumbing Fixtures LLC; www.gerberonline.com.
 - 5. Just Manufacturing Company; www.justmfg.com.
 - 6. Zurn Industries, Inc; www.zurn.com.
 - 7. Fiat Products, Inc; www.fiatproducts.com
 - 8. Substitutions: See Section 01 6000 - Product Requirements.
- B. Bowl: 24 by 24 by 10 inch (600 by 600 by 250 mm) high white molded stone, floor mounted, with one inch (25 mm) wide shoulders, bumper guards, stainless steel strainer.
- C. Trim: ASME A112.18.1 exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

- A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

Not for Construction

SECTION 230010 - BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provisions of the General Conditions and Division 1 – General Requirements, and applicable provisions elsewhere in the Contract Documents apply to the work of Division 23 Mechanical.
- B. Work Included:
 - 1. Include all labor, materials, equipment, and incidental items necessary to complete the work shown, specified and as may be otherwise required for a complete, operational mechanical system.
 - 2. All work under this division shall be subject to all of the provisions of the Contract Documents.
 - 3. One prime Mechanical Subcontractor is to be responsible for all the work done under Division 23 of the Contract Documents, including his forces and lower tier Subcontractors.
- C. Description of Systems: Division 23 work includes, but is not limited to:
 - 1. Heating, Ventilating and Air Conditioning System
- D. References
 - 1. Equipment storage and substitutions – refer to Specification Division 1.
 - 2. Equipment submittals – refer to Specification Division 1.

1.2 CONTRACT DOCUMENT DISCREPANCIES

- A. The Mechanical Contractor shall review all drawings of Architectural, Civil, Structural, Electrical and Mechanical for any items to be included in the Mechanical Contractor's scope of work. Any conflicts, duplications or omissions noted between the mechanical division and any other division shall be brought to the attention of the Architect/Engineer for clarification prior to bid. Conflicts, duplications or omissions noted after the award of the contract shall be the responsibility of the Mechanical Contractor.
- B. In the event of conflicts or discrepancies between the Specifications and the Drawings, or within either document itself, the bid shall be based on the better quality equipment or greater quantity of work.
- C. No changes shall be made to the Contract Documents after award of the contract except those authorized in writing by the Architect/Engineer.

1.3 EXAMINATION OF THE SITE

- A. The plans have been prepared utilizing all available information and obtaining all other data that could reasonably be procured concerning the location of domestic water, storm, sanitary, waste and vent piping, and ductwork. Additional work under this section, caused by the lack of information as to exact tie-ins, locations, or sizes will not be considered as a just cause for a claim for additional compensation. Any person contemplating doing work under this section of the Specifications shall

visit the site of the work, and shall make himself thoroughly familiar with the existing mechanical system, and shall have a thorough understanding of the work to be done. No allowance will be made for insufficient knowledge of the existing site conditions or the scope of the work.

1.4 PLANS AND SPECIFICATIONS

- A. Design drawings are diagrammatic to show general design and routing, equipment capacities, arrangements, and extent of systems. They do not show exact sizes, locations, clearances and details for use with all manufacturer's equipment.
- B. Existing Utilities: Are indicated as accurately as possible on the Drawings. Work on utilities encountered and not indicated on the drawings will be directed by change order after being brought to the attention of the Architect/Engineer. Close openings and repair damage in acceptable manner to utilities encountered.
- C. Specifications give equipment quality and manufacturing details. Drawings provide capacity, size and acceptable brands. Equipment must meet all of these requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Job site documents: Maintain at the job site, one (1) record copy of the following:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed shop drawings
 - 5. Change orders
 - 6. Field test reports
- B. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible condition, apart from documents used for construction.
- C. Record Information: Label each document "RECORD DOCUMENT". Mark information in ink in a contrasting color, keeping each record current daily. Do not conceal any work until required information is recorded.
- D. Record the following information on the drawings:
 - 1. Location of underground utilities.
 - 2. Location of internal utilities and accessories concealed in construction.
 - 3. Field changes of dimension and detail.
 - 4. Changes by change or field order.
 - 5. Details not on original Contract Drawings.
- E. Record the following information on specifications:
 - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 - 2. Changes by change or field order.
 - 3. Other items not specified in original set of specifications.
- F. Shop Drawings: Maintain shop drawings as record documents, recording all changes made after the Architect/Engineer's shop drawing submittal review.

- G. Submittal: At completion of project, deliver Project Record Documents to General Contractor. Changes to drawings shall be updated electronically and delivered to General Contractor in AutoCAD format.

1.6 DIVISION OF RESPONSIBILITY

- A. Subdivisions, subparagraphs or drawing notes indicating a division in the Mechanical Contractor's work are for convenience and assistance only and are not in any way intended to delineate lines of responsibility between Subcontractors and suppliers. The division of such responsibility rests entirely with the Mechanical Contractor and he shall inform his Subcontractors and suppliers accordingly.

1.7 COORDINATION

- A. General: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.
- B. Coordination Drawings: Prepare $\frac{1}{4}$ "=1'-0" scale shop drawings showing duct, piping, conduit, equipment, lights and all necessary items to assure coordination between this and other trades. These drawings are to be used for fabrication and installation; the Design Drawings are not to be used as shop drawings. Responsibility for successful coordination rests entirely with the Contractor. Coordination drawings shall be 3D, in congested areas with provision for collision check. The contractor is responsible for obtaining architectural, structural, mechanical, and plumbing drawings in 3D. All 3D drawing development, collision check, coordination, etc. shall be included as part of the Contractor's base bid.
- C. Installation Procedures: Confer and cooperate with other trades and coordinate the work in proper relation with theirs. Coordinate ceiling cavity space carefully with other trades.
- D. Utility Interruptions: Coordinate mechanical utility interruptions with the Owner and the Utility Company. Plan work so that duration of the interruption is kept to a minimum.
- E. Cutting and Patching:
 - 1. Contractor is responsible for the costs of cutting and patching for work under Division 23 caused by improper coordination or notification. Comply with the requirements of Division 1.
 - 2. Cutting: Coordinate and supervise cutting required. Notify Architect/Engineer before any cutting, channeling, chasing or drilling. Use rotary type drill or other method as approved by the Architect/Engineer. Holes cut with pneumatic hammer will not be accepted. Cutting of steel, wood or other main structural parts must be approved by Architect/Engineer prior to commencing cutting.
 - 3. Patching: Seal openings and repair and refinish any damage to building elements using skilled tradesmen in a manner acceptable to Architect/Engineer.
- F. Drawings and Specifications: The Drawings and Specifications are complimentary; what is called for in either of these is binding as though called for by both. The Mechanical Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do not scale Drawings for dimensions. Take dimensions, measurements, locations, levels, etc., from the Architectural Drawings and equipment to be furnished. No extra compensation will be allowed on account of difference between actual dimensions and those indicated on the Drawings.

G. Discrepancies:

1. Review all Drawings and Specifications of Architectural, Electrical, Structural, and Mechanical for any items to be included by the Mechanical Contractor. Any conflicts, duplications or omissions noted between the Mechanical Division and other divisions prior to the bid shall be brought to the attention of the Architect/Engineer for clarification. Any conflicts, duplications or omissions noted after award of the contract shall be the responsibility of the Mechanical Contractor.
2. Make any changes, at no additional cost to the Owner, to the work of Division 23 made necessary by the failure or neglect to report such conflicts, duplications or omissions. However, it is not the intent of the Specifications that the Contractor be responsible for the correct design of the mechanical systems.

H. Order of Precedence: The precedence of mechanical Construction Documents is as follows:

1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
2. Should there be a conflict within the Specifications or Drawings of the same scale, the more stringent or high quality requirements shall apply.
3. In the Drawings, the precedence shall be drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions, and noted materials over graphic indications.
4. Should there be a conflict between Drawings and Specifications, the Drawings shall have precedence.
5. Should there be a conflict in dimensions or locations between Mechanical Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.8 MECHANICAL/ELECTRICAL COORDINATION

- A. Check and review the Electrical Drawings and Specifications to ensure coordination with Division 26. Any errors and/or omissions noted between Divisions 23 and 26 shall be brought to the attention of the Architect/Engineer for his decision.
- B. It shall be the responsibility of the Mechanical Contractor to transmit to the General Contractor prior to starting any work, all changes of electrical characteristics which result from any substitution of equipment. Any and all charges for such changes shall be the responsibility of the Mechanical Contractor.
- C. Equipment and labor shall be furnished in accordance with the following schedule:

Item	Div. Furnished By	Div. Set/ Mounted by	Div. Wired/ Connected by
Equipment Motors	23	23	26***
Motor controllers, magnetic starters, manual 3-phase starters, reduced voltage starters, etc			
Factory mounted	23	23	26
Provided separately	26	26	26
Disconnect switches, thermal overload switches, toggle disconnect switches	26	26	26
Single speed switches for manually controlled fans	26	26	26
Push buttons and pilot lights	23	23	23
H-O-A switches	23	23	23
Temperature controls, control relays, time clocks serving HVAC equip., control transformers, control panels, solenoid valves	23	23	23
Heat Tracing	23	26	26
Freezestats	23	23	23
Thermostats & Temperature Sensors	23	23	23
Motor valves, damper motors	23	23	23
Interlocks ²³	23	23	
Duct mounted fire/smoke detectors	26	23	26/23*
Fire sprinkler flow switches	23	23	26
Variable frequency drives	23	23	26**
* Div. 26 wires to fire alarm system			
** Div. 26 wires through VFD to motors			
*** Div. 23 wires to fan controls			

1.9 REGULATORY REQUIREMENTS

- A. Contractor shall pay for all permits, inspections, certificates, water tap fees and sewer connection costs applicable to work under Division 23. Water and wastewater development charges and water distribution facility charges are the obligation of the Owner and will be paid by the Owner, including main line recovery charges, if any.
- B. Contractor shall comply with all applicable local and state code requirements and ordinances. Comply with all requirements of utility companies. Call for inspections by local building inspection authority. Applicable codes and ordinances include, but are not limited to, the following:

1. International Building Code, 2009 Edition
2. International Plumbing Code, 2012 Edition
3. International Mechanical Code, 2009 Edition
4. International Existing Building Code, 2009 Edition
5. Governing Fire Department Requirements
6. Utility Company Requirements
7. State of Colorado Energy Requirements
8. State Department of Labor Requirements
9. State Department of Health Requirements
10. National Fire Protection Association Standards and Codes - NFPA
11. State and Federal Safety and Health Laws
12. National Electrical Code 2014

- C. Discrepancies: If discrepancies occur between these Specifications, local codes, local utility requirements, etc., the most stringent requirements or greater quantity of work shall apply.
- D. Where fire or smoke ratings are indicated or required, provide components and assemblies meeting the requirements of the Uniform Building Code, the NFPA and listed by Underwriters' Laboratories, Inc.

1.10 TEMPORARY HEATING

- A. Permanent heating system and equipment shall not be used for temporary building heat during construction, unless written authorization is obtained from the Owner.

1.11 DAMAGED WORK

- A. Remove, reconstruct, refinish or otherwise make acceptable to the Architect/Engineer, work damaged after installation. No extra time extension or monetary compensation will be given for faulty or damaged work.

1.12 ADVERSE WEATHER CONDITIONS

- A. Execute no work under conditions unsuited to proper execution, safety, and permanence. Architect/Engineer's decision in cases of controversy shall be final.

1.13 PROTECTION AGAINST WATER

- A. Keep work dry at all times. Protect all equipment, piping, duct, insulation, etc. from damage due to water while in storage, during installation, and after installation. If dewatering is necessary, provide all equipment required and discharge water in a location where no drainage injury or damage can occur.

1.14 INSPECTIONS

- A. Notify the Architect/Engineer with minimum 48 hours notice when the following inspections are to be performed by the Engineer:

1. First Inspection:

- a. When all ducts and pipes to be concealed are complete and ready for such pressure, leak and other tests as required.
 - b. This inspection will be conducted after all system leaks have been discovered and corrected, and while system is under test, before any equipment or system component is concealed.
 2. Second Inspection:
 - a. When all equipment is in place, but prior to operation of any equipment.
 3. Third Inspection:
 - a. When system is ready to be turned over to Owner, complete and satisfactorily operating in accordance with the Drawings, Specifications and Change Orders.
 - B. Upon notice from Contractor certifying that the work is ready for inspection, Engineer will prepare punchlist of items determined to be incomplete or otherwise not in compliance with the intent of the Contract Documents.
 - C. Contractor shall pay Engineer's costs at the billing rates in effect at the time the services are performed for subsequent punch list visits required due to lack of completion of prior punch list, or if it is determined that the project work is not completed and ready for the requested inspection.
 - D. Contractor shall call for all inspections from the local building department as required by the Authority Having Jurisdiction. Contractor is responsible to call for inspections in a timely manner in order to maintain project schedule.
 - E. Where required, all equipment falling under State Department of Labor Regulations shall be inspected by them. Contractor is responsible to call for these inspections in a timely manner in order to maintain project schedule.
- 1.15 OPERATING AND MAINTENANCE DATA
- A. General: Comply with Division 1.
 - B. Submission: Submit six (6) 8-1/2 x 11" typed and bound copies of operating and maintenance manuals to the Architect/Engineer for approval prior to scheduling any system demonstration or training for the Owner.
 - C. Contents: Manuals shall have index with tab dividers for each major equipment section to facilitate locating information on a specific piece of equipment. Identify data within each section with equipment markings as they appear in the Drawings and Specifications. Include as a minimum the following data:
 1. List of system components, in alphabetical order, with company name, contact person, address and 24 hour phone number of the company responsible for servicing the equipment during the first year of operation.
 2. Operating instructions for the complete system including:
 - a. Emergency procedures for failure of major equipment or fire.
 - b. Major equipment operations, including startup, shutdown, normal operation and emergency equipment shutdown.
 3. Maintenance instructions, including:

- a. Valve tags and other identified equipment lists.
 - b. Proper lubricants and lubricating instructions for each piece of equipment.
 - c. Necessary cleaning, replacement and/or adjustment schedule.
4. Product data on each piece of equipment, including:
- a. Installation instructions.
 - b. Drawings and specifications.
 - c. Parts lists.
 - d. Complete wiring and temperature control diagrams (as-built).
 - e. Marked or changed drawings indicating locations of concealed components and variations from the original system design.
5. Schematic floor diagrams indicating equipment locations, including valves in the systems. Valves shall be numbered for easy identification by owner.
6. Test and Balance Report
7. Simplified description of each system and preventative maintenance program.
8. All start-up cards for equipment.

1.16 CERTIFICATES AND GUARANTEE

- A. Warranty: In accordance with Division 1, provide a written warranty to the Owner covering the entire mechanical work to be free from defective materials, equipment and workmanship for a period of one (1) year from Date of Acceptance. Provide labor and materials as required during this period to repair or replace defects and pay for any damage to other work resulting therefrom, at no additional cost to the Owner. Provide certificates for such items of equipment which have warranties in excess of one (1) year. In addition, compressors for HVAC equipment shall be warranted for an additional four (4) years. All freight shall be prepaid on warranty items. Submit warranty to the General Contractor for delivery to the Owner.
- B. This warranty will be superseded by the terms of any specific equipment warranties or warranty modifications resulting from use of equipment for construction heat or ventilation. This warranty may be voided by improper Owner maintenance practices.

1.17 CERTIFICATES AND KEYS

- A. Certificates: Upon completion of work, secure three (3) copies of all certificates from any state or local Authority Having Jurisdiction indicating that the work is in strict accordance with the applicable codes and submit the certificates to the General Contractor for delivery to the Owner.
- B. Keys: Upon completion of work, submit all keys for mechanical equipment, panels, equipment rooms, etc. to the General Contractor for delivery to the Owner.

1.18 CONTRACTOR'S QUALIFICATIONS

- A. The mechanical contractors (HVAC, plumbing, fire protection, etc.) and all subcontractors shall have installed a minimum of three (3) projects similar in scope, system type, and total construction cost in the past three years. References confirming the above shall be disclosed to the Owner and Architect/Engineer upon request.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. Bidders shall quote on brands and manufacturers of equipment as requested in these Specifications and Drawings. See appropriate section of the Contract Documents for requirements governing the prior approval process.
- B. Submittals from subcontractors and equipment suppliers are to be carefully checked by the Contractor for space requirements and conformance to the Drawings and Specifications. These submittals shall be so noted by the Contractor prior to forwarding to the Architect/Engineer for checking. No deviations from the Drawings and Specifications will be allowed, recognized or considered unless brought to the attention of the Architect/Engineer at the time the submittals are submitted by the Contractor. Submittals not processed by the Contractor before forwarding to the Architect/Engineer for approval will be returned to the Contractor for his prior processing.
- C. Submittals shall include catalog cut-sheets, written descriptions, and specification sheets detailing the associated product, item and assembly.
- D. No substitution for brands named in the Contract Documents will be considered unless written request has been submitted to the Engineer. Each such request shall include a complete description of the proposed substitute, drawings, cut sheets, performance and test data, and any other data or information necessary for complete evaluation. The burden of proving acceptability of a proposed product rests on the party submitting the request for approval. Request for product approval substitutions shall be submitted in writing to the Engineer a minimum of ten (10) working days in advance of the bid date.
- E. Shop drawings shall include details, installation drawings, assembly drawings, fabrication drawings, diagrams, and other information which show adaptation or installation of Contractor-furnished products or materials for overall project.
- F. The purpose of submittals and shop drawings is to ensure Contractor understands design requirements and demonstrates understanding by indicating and detailing intended materials, methods, and installation practices. Submittals and shop drawings are not a method of requesting substitutions or deviation from Specifications. If discrepancies between submittals, shop drawings, and Contract Documents are discovered either prior to or after submittals and shop drawings are reviewed, requirements of Contract Documents shall take precedence.
- G. Each major submittal section (HVAC, plumbing, fire protection) shall be submitted at the same time, with the exception of the energy management system, which may be submitted separately from the HVAC submittal.
- H. In the front of each submittal, the Mechanical Contractor shall include a signed letter from the project Electrical Contractor indicating that the Electrical Contractor has reviewed the mechanical submittals and has verified that the equipment being submitted will conform to the design of the project electrical systems.
- I. After Architect/Engineer review, submittals and shop drawings will be returned together with Submittal Review Sheet which indicates comments on submittals and shop drawings and with specific actions such as "No Exception Taken", "Make Corrections Noted", "Rejected", and "Resubmit". Continue to resubmit submittals and shop drawings until "No Exception Taken" or "Make Corrections Noted-Resubmittal Not Required" action is indicated.
- J. Shop drawings shall be submitted for each of the following items as applicable:

1. Fans
2. Fire & Smoke Dampers
3. Air Distribution Devices
4. Automatic Dampers
5. Roof Mounted Air Intake/Relief Hoods
6. Flexible Ductwork
7. Electric Heaters
8. Ductwork & Ductwork Construction
9. Duct Access Doors/Panels
10. Vibration Isolation Equipment
11. Gas Appliance Venting Flues and/or Fans
12. Roof Mounted Packaged Units
13. Air Handling Units
14. Condensing Units
15. Manual Dampers
16. Roof Curbs
17. Pumps
18. Automatic Flow Control Valves
19. Boilers
20. Plate & Frame Heat Exchangers
21. Chillers
22. Centrifugal Sediment Separator
23. Thermometers
24. Pressure Gauges
25. Hot Water Unit Heaters
26. Water Source Heat Pumps
27. Flexible Pipe Hose Kits w/ Valves & Fittings
28. Kiln Hood
29. Energy Recovery Units
30. Kitchen Range Hood & Associated Fire Suppression System
31. Residential Range Hood & Associated Fire Suppression System
32. HVAC Pipe Accessories
33. Controls & Control Diagrams including Wiring Plans
34. Pipe & Duct Insulation & Accessories
35. Pipe and Pipe Fittings
36. Pipe Identification Systems
37. Pressure Reducing Valves
38. Relief Valves
39. Pipe Hangers, Supports & Accessories
40. Pipe Accessories

2.2 DELIVERY, STORAGE AND HANDLING

A. General:

1. Comply with Specification Division 1.
2. Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer name, trade name, type, class, grade, size and color.

B. Protection: Store materials and equipment off of the ground and under cover, protected from damage. Exercise care to prevent damage to materials during loading, transporting and unloading.

C. Large items: Make arrangements with other project contractors for moving equipment that is too large to pass through finished openings into the building.

- D. Acceptance: Check and sign for materials to be furnished by others for installation under Division 23 upon delivery. Assume responsibility for the storage and safekeeping of such materials from time of delivery until final acceptance.

PART 3 - EXECUTION

3.1 INTENT

- A. All drawings, specifications and details shown or noted are to indicate design and required results, and shall be followed in spirit and intent as well as to the letter.
- B. Provide satisfactory, complete installation in accordance with the intent of the drawings and specifications, including incidental items required even though not particularly specified or indicated.
- C. Should a specific Contractor or supplier require other or additional work or materials to obtain the required results or test, the Contractor shall furnish such work or materials as part of his contract at no additional cost to the owner.

3.2 LICENSING:

- A. Heating, ventilating and air conditioning work shall be performed under the direct supervision of a commercially licensed HVAC contractor, licensed in the state where the work is being performed.

3.3 INSTALLATION

- A. Execute work such that all components function together as a complete, workable system. Make slight alterations necessary to make adjustable parts fit with fixed parts. Execute work to contribute to efficiency of operation, accessibility, sightliness, and minimum maintenance clearances. Leave equipment properly adjusted and in working order.
- B. Verify dimensions indicated and report any error or inconsistency before commencing work.
- C. Coordinate work with other trades through the General Contractor so that equipment, especially in the ceiling, will fit to patterns of finished materials, and locate all elements to carry harmony of architectural design throughout the building. Coordinate work with other trades to avoid conflicts, especially in places where close, careful fitting is required. Coordination problems and field solutions must be approved through the General Contractor and the Architect/Engineer before proceeding with work.
- D. Conform and accommodate systems to the building structure, equipment and usage so that they do not interfere with the operation of any other system or operational part of the building.
- E. Preparation: Final installation of materials and equipment shall be based on actual dimensions and conditions at the job site. Field measure for materials or equipment requiring exact fit.
- F. Workmanship: Perform work in accordance with good commercial practice and all applicable trade standards, including current SMACNA standards. The finished appearance of the work shall be of equal importance with its mechanical efficiency.

- G. Clearances: The Subcontractors working under this Division shall be responsible for the sufficiency of the size of shafts and chases, and clearances in double partitions and hung ceilings for proper equipment installation. Cooperate with Contractors of other Divisions whose work is in the same space and advise the General Contractor of requirements. Such spaces and clearances shall be kept to the minimum size required.
- H. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, shock absorbers, traps, cleanouts, motors, controllers, switchgear, drain points, manual dampers, and smoke and fire dampers. If required for accessibility, the Contractor shall furnish access doors for this purpose, subject to the following:
1. Access door shall be sized to permit removal of equipment, or 24"x24" if used for service only.
 2. Furnish doors to trades performing work in which they are to be installed. Group valves, devices and other equipment to permit use of minimum number of access doors.
 3. Doors shall be lockable and suitable for painting to match adjacent finishes.
- I. Minor deviations from the Drawings may be allowed to provide for better equipment accessibility. The General Contractor shall approve of any change prior to this Contractor making the change.
- J. Properly locate anchors, chases, recesses and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc., and for the leaving of the required chases, recesses and openings in sufficient time to be installed in the normal course of work. Install equipment and materials in accordance with manufacturer recommendations unless specifically indicated otherwise, or where local codes or regulations take precedence. This includes the performance of tests the manufacturer recommends. It is intended that anything, whether labor or materials, which is usually furnished as a part of any equipment specified and which is necessary for the best operation shall be furnished as a part of the contract without additional cost, whether or not shown or described.
- K. Testing: See section 23 0593 and individual Specification sections in Division 23 for testing of mechanical work.
- L. Protection: Cover and seal ends of pipe and ductwork during construction to prevent entry of foreign material and moisture. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Protect fixtures and equipment against damage during mechanical work. All air handling equipment shall be fitted with high-quality, 30% min. efficient pleated filters prior to any operation. The use of "construction filters" is NOT authorized.
- M. Freeze Protection: Do not run piping in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection. Water piping exposed to freezing conditions shall be insulated as specified, with aluminum weather jacket and electric heating cable, thermostatically controlled, as specified under 23 0533. Heat tracing shall be coordinated with Electrical Contractor and installed on all exterior water piping, per applicable Division 23 and 26 Specifications.
- N. Scaffolding, Rigging and Hoisting: Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required.
- O. Materials and apparatus required for the work to be new, of first-class quality, and to be furnished, delivered, installed, connected and finished in every detail. Equipment shall be selected and arranged such that it fits properly into the building space provided. Where no specific kind or quality of material is given, a first-class standard article shall be furnished.

- P. Equipment start-up and adjustment of all HVAC equipment and water heaters shall be performed by certified factory representatives of the respective equipment manufacturer.
- Q. Furnish the services of an experienced superintendent, who will be constantly in charge of installation of the work, together with all skilled tradesmen, fitters, helpers and labor required to unload, transfer, erect, connect, adjust, start, operate and test each system.

3.4 THROUGH PENETRATIONS

A. References:

1. ASTM E 814: Standard Test Methods for Fire Tests of Through-Penetration Firestops.
2. UL 1479 Standard for Fire Tests of Through-Penetration Firestops, including optional air leakage test.

B. Non-Rated Walls

1. All penetrations through concrete or masonry walls shall be sleeved with a steel standard weight pipe sleeve which shall be grouted in place. Closures shall be provided between the pipe and sleeve wherever an exterior wall or is penetrated. Use Link-Seal modular rubber seals as manufactured by Thunderline Corp., Wayne, Michigan.

C. Fire Resistance Rated Assemblies

1. Performance Requirements

- a. Penetrations: Provide through-penetration firestop systems that are installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.
 - 1) Install complete through penetration firestop systems that have been tested and are listed by recognized testing agencies per ASTM E 814 or UL 1479 fire tests in a configuration that is representative of site conditions.
 - 2) F-Rated Systems: Install through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814 or UL 1479, but not less than the fire resistance rating of the assembly being penetrated.
 - 3) T-Rated Systems: Install through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814 or UL 1479, where required by the Building Code.
 - 4) L-Rated Systems: Install through-penetration firestop systems with L-ratings as determined by UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.
 - 5) W-Rated Systems: Install through-penetration firestop systems meeting W-Rating Class 1 Requirements as determined by the UL Water Leakage Test for systems tested and listed in accordance with UL 1479 and as required by the owner, architect or Authority Having Jurisdiction.
 - 6) For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 7) For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2. Schedules

- a. Unless otherwise noted on the drawings. Provide the fire stop systems or their approved equal as listed below:
 - 1) Metallic Pipe, Metallic Ductwork, Non-Metallic Pipe smaller than 2".

- 2) 3M Fire Barrier Sealant CP 25WB+:
 - 3) Material Description: Intumescent latex/water based caulk
 - 4) Formulation: No-sag, non-halogen formula. Fast drying. Paintable
 - 5) Water Resistance: Provide water resistant seal
 - 6) Non-Metallic Pipe 2"-4"
 - 7) 3M Fire Barrier FS-195+ Wrap/Strip with 3M Fire Barrier RC-1 Restricting Collar:
 - 8) FS-195+ Material Description: One-part, organic/inorganic intumescent elastomeric strip with foil on one side.
3. Installation of Through-Penetration Firestop Systems

a. General

- 1) Install through-penetration firestop systems to comply with "Performance Requirements" above and firestop systems manufacturer's written installation instructions and published drawings for products and applications indicated.
 - 2) Install forming/damming/backing materials and other accessories of types required to support fill material during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop system.
 - 3) Install fill materials for firestop systems by proven techniques to produce the following results:
 - 4) Fill voids and cavities formed by openings, forming materials, accessories and penetrating items as required to achieve the fire-resistance ratings indicated.
 - 5) Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- b. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining surfaces.
- c. Watertight. Meets UL Water Leakage Test - Class 1 requirements for systems tested and listed in accordance with the criteria of ASTM E 814 (UL 1479) Standard Test Method for Fire Tests of Through-Penetration Fire Stops. W Rating - Class 1 requirements include a minimum water column exposure of 3 ft. for 72 hours prior to the standard time / temperature curve for the fire test.

4. Field Quality Control

- a. Proceed with enclosing through-penetration firestop systems with other construction only after inspection and approval by Authority Having Jurisdiction.
- b. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 EXCAVATING AND BACKFILLING

- A. All underground utilities shall be located and marked prior to excavating. Contractor shall instruct and train employees on markings, color codes, and excavation and safety procedures for natural gas lines. When excavation approaches gas lines, expose lines by carefully probing and hand digging.
- B. Perform excavation and backfilling per Division 31, and in strict accordance with the latest OSHA regulations. Sheeting, bracing, barricades, fencing and trench wall supports shall be provided wherever necessary to prevent injury to Contractor personnel or passersby.

- C. Trench walls shall be a minimum of 6" from each side of mechanical piping being installed. Install adjacent pipes with minimum of 6" clearance between when located in same trench.
- D. Do not backfill until work has been inspected, tested and approved. Backfill material shall be approved by Architect/Engineer. Do not bury lumber, metal or other debris with backfill.
- E. Repair any damage to finished surfaces.

3.6 CLEANING

- A. Cleaning During Construction and Final Cleaning: Comply with General Requirements.
- B. Clean exposed surfaces of piping, hangers, ducts and other exposed items of grease, dirt or other foreign material. Clean and polish plumbing fixtures, fittings, and exposed plated piping. Leave clean and free from paint, grease, dirt, etc. Remove labels from exposed equipment. Carefully and thoroughly clean all items of equipment. If finishes have been damaged, refinish to original condition using factory-provided matching paint, and leave all equipment in proper working order and intended appearance. At the completion of the work, remove all rubbish, cleaning supplies and debris resulting from the operation and leave spaces clean and ready to use.
- C. Replace air filters in all equipment immediately prior to Owner's Date of Acceptance. Clean ducts, blowers and coils if units were operated without filters at any time during construction. Provide one (1) complete set of clean filters to Owner at project turnover.
- D. Flush all piping systems free of foreign substances before installing valves or making final connections. Notify the Owner seven (7) days in advance of final flushing so that Owner may attend and verify the cleanliness of the pipe.

3.7 MECHANICAL SERVICE AND MAINTENANCE

- A. Include four (4) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout one (1) year warranty period. During each maintenance call, technicians shall:
 - 1. Verify proper working order of safety devices on each piece of equipment.
 - 2. Check lubrication of all moving parts and lubricate as necessary.
 - 3. Adjust V-belt drives for proper belt tension.
 - 4. Verify proper operating temperatures, pressures, flows, etc. for each major piece of equipment.

3.8 EXISTING MECHANICAL PLANT OPERATIONS

- A. General: Coordinate with the Owner's authorized representative prior to any operations which may affect the normal operations of the Owner. Obtain written authorization from the Owner's representative before commencing operations in an area in which the work could reasonably be expected to cause undue inconvenience to or interrupt normal operations of the Owner.
- B. Provide protection to prevent damage or interference to existing utilities. In the event of accidental interruption of a service or utility, inform General Contractor, Owner, and related utility company without delay, and take prompt remedial action.

1. Schedule work requiring disconnecting, reconnecting, and interruption of services and utilities with General Contractor, Owner and utility companies.
 2. Maintain electrical and mechanical services and utilities unless interruptions are scheduled.
 3. Provide and remove temporary connections when no longer required.
- C. Relocation of Services: Active piping, electrical and/or telephone systems which are not indicated on the drawings which would interfere with or hinder the progress of the work shall be relocated by the Contractor at no additional cost.
- D. Conditions for Interconnection and Modification: Carefully schedule and coordinate all work with an authorized representative of the Owner. Contractor shall have all of his major equipment and associated materials in his possession and prefabricated to the extent necessary before starting any work which will cause the Owner to be without mechanical and/or electrical services. Upon starting such work which will result in outage of mechanical or electrical services, the Contractor shall proceed without delay to reinstate services by quick and deliberate performance of the appropriate work. Contractor shall consider that weekend and overtime work will be necessary to install and connect new equipment.

3.9 EXISTING SYSTEM MODIFICATIONS

- A. Modifications to the existing mechanical systems and associated structural and electrical components shall be provided as indicated and as necessary to accomplish the work of this division. Modifications shall include the removal of piping, equipment and components, relocation of components, termination and relocation of utilities, cutting, patching, cleaning, adjusting and refinishing, and all incidental work related to these tasks.
- B. No cutting shall be done to structural members unless indicated, or unless specific approval is obtained from the Architect.
- C. Cutting shall be done neatly to allow satisfactory patching that will blend with adjacent surfaces. Unless otherwise approved, rotary saws shall be used that ensure cutting concrete, asphalt, masonry, walls, ceilings, etc. in a straight line.
- D. Patching shall be completed in accordance with the appropriate section of these Specifications if such section exists. If no such section covering materials and procedures exists, patchwork shall be accomplished with materials most similar to the existing, and with such procedures as may be necessary to match the existing work. Each Subcontractor shall be responsible for cutting and patching required for their trade.

3.10 DEMOLITION

- A. Contractor shall demolish and remove portions of piping and equipment as shown and as necessary to add the new equipment indicated. Maintain existing connections to downstream devices affected by demolition. Existing equipment to be removed shall first be offered to the Owner for his use, and if rejected by the Owner, shall become the property of the Contractor and removed from the site.

END OF SECTION 230010

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. 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. HVAC demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 1. CPVC: Chlorinated polyvinyl chloride plastic.
 2. PE: Polyethylene plastic.
 3. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 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 HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided 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.

1.6 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.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC 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. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. 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.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
1. CPVC Piping: ASTM F 493.

2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 1. Available Manufacturers:
 - a. Eslon Thermoplastics.
- B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
 1. Available Manufacturers:
 - a. Thompson Plastics, Inc.
- C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
 1. Available Manufacturers:
 - a. NIBCO INC.
 - b. NIBCO, Inc.; Chemtrol Div.

2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
 1. Available Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Eclipse, Inc.
 - d. Epco Sales, Inc.
 - e. Hart Industries, International, Inc.
 - f. Watts Industries, Inc.; Water Products Div.
 - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Company.
 - c. Epco Sales, Inc.
 - d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.

2. 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 Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDMNBR Insert other interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. 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.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

- 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.
- C. One-Piece, Cast-Brass Type: With set screw.
 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 1. Finish: Polished chrome-plated.
- E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.
- F. Split-Plate, Stamped-Steel Type: With concealed hinge, spring clips, and chrome-plated finish.
- G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, 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

3.1 HVAC DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 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. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 - 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 7. 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.

3.2 PIPING SYSTEMS- COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 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. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
 - h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
 - 2. Existing Piping: Use the following:
 - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
 - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
 - f. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
 - g. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. 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. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
 - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with grout.
 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 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 lead-free 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. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. 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. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. 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.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

- A. 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.

3.5 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 HVAC 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.

3.6 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 7. Use 3000-psi , 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.10 GROUTING

- A. Mix and install grout for HVAC 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 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 -GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 -PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 6400 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.

- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 -EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Iron ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.
10. Lubricated plug valves.
11. Eccentric plug valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 SUBMITTALS

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

1.5 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 B31.1 for power piping valves.
 3. ASME B31.9 for building services piping valves.

1.6 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. Set butterfly valves closed or slightly open.
 6. 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

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to HVAC 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. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
 3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. 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.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. NIBCO INC.
 - d. Engineer-approved alternate.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 400 psig.
 - c. Body Design: One piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded.
 - f. Seats: PTFE or TFE.
 - g. Stem: Bronze.
 - h. Ball: Chrome-plated brass.
 - i. Port: Reduced.

B. One-Piece, Reduced-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. NIBCO INC.
2. Description:

- a. Standard: MSS SP-110.
- b. CWP Rating: 600 psig.
- c. Body Design: One piece.
- d. Body Material: Bronze.
- e. Ends: Threaded.
- f. Seats: PTFE or TFE.
- g. Stem: Stainless steel.
- h. Ball: Stainless steel, vented.
- i. Port: Reduced.

C. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. American Valve, Inc.
- b. Conbraco Industries, Inc.; Apollo Valves.
- c. Crane Co.; Crane Valve Group; Crane Valves.
- d. Hammond Valve.
- e. Lance Valves; a division of Advanced Thermal Systems, Inc.
- f. Legend Valve.
- g. Milwaukee Valve Company.
- h. NIBCO INC.
- i. Red-White Valve Corporation.
- j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig.
- c. CWP Rating: 600 psig.
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

D. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Conbraco Industries, Inc.; Apollo Valves.
- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. Hammond Valve.
- d. Lance Valves; a division of Advanced Thermal Systems, Inc.
- e. Milwaukee Valve Company.
- f. NIBCO INC.
- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.3 IRON BALL VALVES

A. Class 125, Iron Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Kitz Corporation.
 - d. Sure Flow Equipment Inc.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-72.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Split body.
 - d. Body Material: ASTM A 126, gray iron.
 - e. Ends: Flanged.
 - f. Seats: PTFE or TFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel.
 - i. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
 - b. Bray Controls; a division of Bray International.
 - c. Conbraco Industries, Inc.; Apollo Valves.
 - d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
 - e. Crane Co.; Crane Valve Group; Jenkins Valves.

- f. Crane Co.; Crane Valve Group; Stockham Division.
- g. DeZurik Water Controls.
- h. Hammond Valve.
- i. Kitz Corporation.
- j. Milwaukee Valve Company.
- k. NIBCO INC.
- l. Norriseal; a Dover Corporation company.
- m. Red-White Valve Corporation.
- n. Spence Strainers International; a division of CIRCOR International.
- o. Tyco Valves & Controls; a unit of Tyco Flow Control.
- p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-67, Type I.
- b. CWP Rating: 150 psig.
- c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
- e. Seat: EPDM.
- f. Stem: One- or two-piece stainless steel.
- g. Disc: Aluminum bronze.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Jenkins Valves.
- c. Hammond Valve.
- d. Milwaukee Valve Company.
- e. NIBCO INC.
- f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 4.
- b. CWP Rating: 300 psig.
- c. Body Design: Horizontal flow.
- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Legend Valve.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Sure Flow Equipment Inc.
 - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - m. Zy-Tech Global Industries, Inc.

2. **Description:**

- a. Standard: MSS SP-71, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Design: Clear or full waterway.
- e. Body Material: ASTM A 126, gray iron with bolted bonnet.
- f. Ends: Flanged.
- g. Trim: Bronze.
- h. Gasket: Asbestos free.

B. **Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:**

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Crane Co.; Crane Valve Group; Stockham Division.

2. **Description:**

- a. Standard: MSS SP-71, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Design: Clear or full waterway.
- e. Body Material: ASTM A 126, gray iron with bolted bonnet.
- f. Ends: Flanged.
- g. Trim: Composition.
- h. Seat Ring: Bronze.
- i. Disc Holder: Bronze.
- j. Disc: PTFE or TFE.
- k. Gasket: Asbestos free.

2.7 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - l. Zy-Tech Global Industries, Inc.

2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - k. Zy-Tech Global Industries, Inc.

2. Description:
 - a. Standard: MSS SP-80, Type 2.

- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

C. Class 150, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hammond Valve.
 - b. Kitz Corporation.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Powell Valves.
 - f. Red-White Valve Corporation.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - h. Insert manufacturer's name.
2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 300 psig.
 - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
 - d. Ends: Threaded.
 - e. Stem: Bronze.
 - f. Disc: Solid wedge; bronze.
 - g. Packing: Asbestos free.
 - h. Handwheel: Malleable iron, bronze, or aluminum.

D. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
 - c. Hammond Valve.
 - d. Kitz Corporation.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Powell Valves.
 - h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - i. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 2.
 - b. CWP Rating: 300 psig.

- c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

2.8 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Flo Fab Inc.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Legend Valve.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
 - j. Powell Valves.
 - k. Red-White Valve Corporation.
 - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - m. Zy-Tech Global Industries, Inc.
2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Flo Fab Inc.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Legend Valve.
 - h. Milwaukee Valve Company.

- i. NIBCO INC.
- j. Powell Valves.
- k. Red-White Valve Corporation.
- l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- m. Zy-Tech Global Industries, Inc.

2. Description:

- a. Standard: MSS SP-70, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Material: ASTM A 126, gray iron with bolted bonnet.
- e. Ends: Flanged.
- f. Trim: Bronze.
- g. Disc: Solid wedge.
- h. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Crane Co.; Crane Valve Group; Crane Valves.
- b. Hammond Valve.
- c. Kitz Corporation.
- d. Milwaukee Valve Company.
- e. NIBCO INC.
- f. Powell Valves.
- g. Red-White Valve Corporation.
- h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- i. Zy-Tech Global Industries, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 2.
- b. CWP Rating: 300 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: PTFE or TFE.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Powell Valves.
 - i. Red-White Valve Corporation.
 - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - k. Zy-Tech Global Industries, Inc.

2. **Description:**
 - a. Standard: MSS SP-85, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. 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.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 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:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 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.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly, gate, or plug valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service except Steam: Globe, ball, or butterfly valves.
 - 4. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
 - b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, resilient-seat check valves.
- 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 Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged ends.

END OF SECTION 230523

Not for Construction

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Available Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. Anvil (formerly Grinnell Corp.)
 - 3. PHS Industries, Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 TRAPEZE PIPE HANGERS

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

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Available Manufacturers:
 - 1. Carpenter & Paterson, Inc.
 - 2. ERICO/Michigan Hanger Co.
 - 3. PHS Industries, Inc.
 - 4. Pipe Shields, Inc.
 - 5. Rilco Manufacturing Company, Inc.
 - 6. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head.
 - c. Masterset Fastening Systems, Inc.
 - d. MKT Fastening, LLC.
 - e. Powers Fasteners.

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

1. Available Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. Empire Industries, Inc.
 - c. Hilti, Inc.
 - d. ITW Ramset/Red Head.
 - e. MKT Fastening, LLC.
 - f. Powers Fasteners.

2.6 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified 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. 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 noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
- F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- H. 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-joint 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. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- I. 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.
- J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- 3.2 HANGER AND SUPPORT INSTALLATION
- A. Steel 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 building structure.
- B. 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 above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. 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.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. 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.

- J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- L. Insulated Piping: Comply with the following:
 - 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 according to ASME B31.1 for power piping and 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.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. 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.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood inserts.
 - 6. Insert Material: Length at least as long as protective shield.
 - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.
- 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 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 contours of welded surfaces match adjacent contours.

3.4 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 .

3.5 PAINTING

- A. Touch Up: 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 minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

Not for Construction

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Stencils.
 - 6. Valve tags.
 - 7. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 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

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
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 2-1/2 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.

B. 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.

C. 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.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 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.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid 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.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- 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. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.5 STENCILS

- A. Stencils: Stencils are not allowed.

2.6 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass 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.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.7 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

3.1 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.

3.2 EQUIPMENT LABEL INSTALLATION

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

3.3 PIPE LABEL INSTALLATION

- A. 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. Locate labels on piping at maximum 15 foot intervals where piping is exposed or concealed.

B. Pipe Label Color Schedule:

1. Chilled-Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
2. Heating Water Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
3. Steam and Condensate Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 1. Blue: For cold-air supply ducts.
 2. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Locate labels where ducts are routed in ceilings, enter into concealed spaces, and in mechanical rooms at maximum intervals of 15 feet.
 1. Exposed ductwork in occupied areas shall not be labeled.

3.5 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 HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

3.6 WARNING-TAG INSTALLATION

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

END OF SECTION 230553

Not for Construction

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
 - 1. Air Systems:
 - a. Constant-volume air systems.
 - 2. HVAC equipment quantitative-performance settings.
 - 3. Verifying that automatic control devices are functioning properly.
 - 4. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- E. NC: Noise criteria.
- F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- G. RC: Room criteria.
- H. Report Forms: Test data sheets for recording test data in logical order.
- I. Smoke-Control System: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.

- J. **Smoke-Control Zone:** A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke-control system.
- K. **Stair Pressurization System:** A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.
- L. **Static Head:** The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- M. **Suction Head:** The height of fluid surface above the centerline of the pump on the suction side.
- N. **System Effect:** A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- O. **System Effect Factors:** Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- P. **TAB:** Testing, adjusting, and balancing.
- Q. **Terminal:** A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- R. **Test:** A procedure to determine quantitative performance of systems or equipment.
- S. **Testing, Adjusting, and Balancing (TAB) Firm:** The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

- A. **Strategies and Procedures Plan:** Within 60 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- B. **Certified TAB Reports:** Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- C. **Sample Report Forms:** Submit two sets of sample TAB report forms.

1.5 QUALITY ASSURANCE

- A. **TAB Firm Qualifications:** Engage a TAB firm certified by AABC, NEBB, or TABB.
- B. **Certification of TAB Reports:** Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. **TAB Report Forms:** Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

- D. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."
- E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.
 - 1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.
- F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- G. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner may occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- C. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in ASHRAE 111 and this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing,

close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling unit components.
- K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

- a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
 - B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
 - C. Measure terminal outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
 - D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.
- 3.6 PROCEDURES FOR TEMPERATURE MEASUREMENTS
- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
 - B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

- C. Measure outside-air, wet- and dry-bulb temperatures.

3.7 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS

- A. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.
- B. Measure, adjust, and record the pressurization of each room, each zone, and each building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.
- C. Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.
 - 1. For pressure measurements, measure and record the pressure difference between the intended spaces at the door with all doors in the space closed. Record the high-pressure side, low-pressure side, and pressure difference between each adjacent space.
 - 2. For applications with cascading levels of space pressurization, begin in the most critical space and work to the least critical space.
 - 3. Test room pressurization first, then zones, and finish with building pressurization.
- D. To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.
- E. For spaces with pressurization being monitored and controlled automatically, observe and adjust the controls to achieve the desired set point.
 - 1. Compare the values of the measurements taken to the measured values of the control system instruments and report findings.
 - 2. Check the repeatability of the controls by successive tests designed to temporarily alter the ability to achieve space pressurization. Test overpressurization and underpressurization, and observe and report on the system's ability to revert to the set point.
 - 3. For spaces served by variable-air-volume supply and exhaust systems, measure space pressurization at indicated airflow and minimum airflow conditions.
- F. In spaces that employ multiple modes of operation, such as normal mode and emergency mode or occupied mode and unoccupied mode, measure, adjust, and record data for each operating mode.
- G. Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

3.8 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.

- D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Check free travel and proper operation of control devices such as damper and valve operators.
- F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- G. Check the interaction of electrically operated switch transducers.
- H. Check the interaction of interlock and lockout systems.
- I. Check main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.9 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Minus 10 to plus 10 percent.
 - 2. Air Outlets and Inlets: minus 10 to plus 10 percent.

3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
 - 1. Fan curves.

2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
 2. Name and address of TAB firm.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB firm who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer, type size, and fittings.
 14. Notes to explain why certain final data in the body of reports varies from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data: Include the following:
 - a. Unit identification.
 - b. Location.

- c. Make and type.
- d. Model number and unit size.
- e. Manufacturer's serial number.
- f. Unit arrangement and class.
- g. Discharge arrangement.
- h. Sheave make, size in inches, and bore.
- i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
- j. Number of belts, make, and size.
- k. Number of filters, type, and size.

2. Motor Data:

- a. Make and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Filter static-pressure differential in inches wg.
- f. Preheat coil static-pressure differential in inches wg.
- g. Cooling coil static-pressure differential in inches wg.
- h. Heating coil static-pressure differential in inches wg.
- i. Outside airflow in cfm.
- j. Return airflow in cfm.
- k. Outside-air damper position.
- l. Return-air damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

- a. System identification.
- b. Location.
- c. Coil type.
- d. Number of rows.
- e. Fin spacing in fins per inch o.c.
- f. Make and model number.
- g. Face area in sq. ft..
- h. Tube size in NPS.
- i. Tube and fin materials.
- j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

- a. Airflow rate in cfm.
- b. Average face velocity in fpm.
- c. Air pressure drop in inches wg.
- d. Outside-air, wet- and dry-bulb temperatures in deg F.

- e. Return-air, wet- and dry-bulb temperatures in deg F.
- f. Entering-air, wet- and dry-bulb temperatures in deg F.
- g. Leaving-air, wet- and dry-bulb temperatures in deg F.
- h. Refrigerant expansion valve and refrigerant types.
- i. Refrigerant suction pressure in psig.
- j. Refrigerant suction temperature in deg F.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.
- g. Sheave make, size in inches, and bore.
- h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

- a. Make and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches, and bore.
- f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
- g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm.
- b. Total system static pressure in inches wg.
- c. Fan rpm.
- d. Discharge static pressure in inches wg.
- e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

- a. System and air-handling unit number.
- b. Location and zone.
- c. Traverse air temperature in deg F.
- d. Duct static pressure in inches wg.
- e. Duct size in inches.
- f. Duct area in sq. ft..
- g. Indicated airflow rate in cfm.
- h. Indicated velocity in fpm.
- i. Actual airflow rate in cfm.
- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

J. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.12 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 -GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Cellular glass.
 - b. Mineral fiber.
2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied jackets.
10. Tapes.
11. Securements.
12. Corner angles.

B. Related Sections:

1. Division 21 Section "Fire-Suppression Systems Insulation."
2. Division 22 Section "Plumbing Insulation."
3. Division 23 Section "Metal Ducts" for duct liners.
4. Division 33 Section "Underground Hydronic Energy Distribution" for loose-fill pipe insulation in underground piping outside the building.

1.2 SUBMITTALS

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

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.
8. Detail field application for each equipment type.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting 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.

PART 2 -PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 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. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 2. Block Insulation: ASTM C 552, Type I.
 3. Special-Shaped Insulation: ASTM C 552, Type III.
 4. Board Insulation: ASTM C 552, Type IV.
 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the

following:

- a. CertainTeed Corp.; Duct Wrap.
- b. Johns Manville; Microlite.
- c. Knauf Insulation; Duct Wrap.
- d. Manson Insulation Inc.; Alley Wrap.
- e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation without factory-applied jacket. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide the following:

- a. CertainTeed Corp.; Commercial Board.
- b. Fibrex Insulations Inc.; FBX.
- c. Johns Manville; 800 Series Spin-Glas.
- d. Knauf Insulation; Insulation Board.
- e. Manson Insulation Inc.; AK Board.
- f. Owens Corning; Fiberglas 700 Series.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Fibrex Insulations Inc.; Coreplus 1200.
- b. Johns Manville; Micro-Lok.
- c. Knauf Insulation; 1000 Pipe Insulation.
- d. Manson Insulation Inc.; Alley-K.
- e. Owens Corning; 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. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. CertainTeed Corp.; FlameChek.
- b. Johns Manville; Firetemp Wrap.
- c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
- d. Thermal Ceramics; FireMaster Duct Wrap.
- e. 3M; Fire Barrier Wrap Products.
- f. Unifrax Corporation; FyreWrap.
- g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.

2.3 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.4 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. 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. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. 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.
 5. Factory-fabricated tank heads and tank side panels.
- D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; Metal Jacketing Systems.
 - b. PABCO Metals Corporation; Surefit.
 - c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
 3. Finish and thickness are indicated in field-applied jacket schedules.
 4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 6. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.
- E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

2.5 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
- B. Insulation Pins and Hangers:
1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

- D. Wire: 0.080-inch nickel-copper alloy.

2.6 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 -EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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] [4 inches] o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Manholes.
 5. Handholes.
 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof 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.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. 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.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Pipe: Install insulation continuously through floor penetrations.
 3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 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, vessels, and equipment. 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.

3.5 MINERAL-FIBER INSULATION INSTALLATION

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 but 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.
- E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

- d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.

- e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. 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.
- B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. 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.
- C. 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.
- D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presizes jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.7 FINISHES

- A. Duct, Equipment, and Pipe Insulation with ASJ 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.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, 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 one location for each duct system defined in the "Duct Insulation Schedule, General" Article.
 2. 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 welded fittings, two locations of strainers, two locations of valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

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

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket board, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- D. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- E. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket; thickness as required to achieve 2-hour fire rating.
- F. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- G. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- H. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 0.75-lb/cu. ft. nominal density.
- I. Exposed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 0.75-lb/cu. ft. nominal density.

3.11 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. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping: Mineral-fiber, preformed pipe insulation, 1 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping: Insulation shall be one of the following:
 - 1. Cellular Glass: 2 inches thick.
 - 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Concealed:
 - 1. None.
- D. Ducts and Plenums, Exposed:
 - 1. None.
- E. Piping, Concealed:
 - 1. None.
- F. Piping, Exposed:
 - 1. PVC, Color-Coded by System: 30 mils thick.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. Aluminum, Corrugated: 0.020 inch thick.

D. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Corrugated: 0.020 inch thick.

E. Piping, Concealed:

1. PVC: 30 mils thick.

F. Piping, Exposed:

1. Aluminum, Corrugated: 0.020 inch thick.

END OF SECTION 230700

SECTION 232300 - REFRIGERANT PIPING

PART 1 -GENERAL

1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.3 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 -PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.

2.2 REFRIGERANTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

PART 3 -EXECUTION

3.1 VALVE AND SPECIALTY APPLICATIONS

- A. Install valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Install a full-sized, three-valve bypass around filter dryers.
- E. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

3.2 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 Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- 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 adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in protective conduit where installed belowground.
- N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- O. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
- P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties.

Do not apply heat near expansion-valve bulb.

- Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- R. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."
- S. Install sleeves for piping penetrations of walls, ceilings, and floors.
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BA_g, cadmium-free silver alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.
- D. Support multifloor vertical runs at least at each floor.

3.5 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Verify that compressor oil level is correct.
 - 2. Open compressor suction and discharge valves.
 - 3. Open refrigerant valves except bypass valves that are used for other purposes.
 - 4. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 -GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Fittings.
5. Reinforcement and spacing.
6. Seam and joint construction.
7. Penetrations through fire-rated and other partitions.
8. Equipment installation based on equipment being used on Project.
9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1,

Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 -PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 3 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: Minus 40 to plus 200 deg F.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 - 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant 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. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant 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."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A

603.

- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 -EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire

dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Outdoor, Supply-Air Ducts: Seal Class A.
 - 3. Outdoor, Exhaust Ducts: Seal Class C.
 - 4. Outdoor, Return-Air Ducts: Seal Class C.
 - 5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
 - 7. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 8. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
 - 10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
 - 11. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and

other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.7 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
 - a. Pressure Class: Positive 2-inch wg.
2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 2-inch wg.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
 - a. Pressure Class: Positive or negative 2-inch wg.
2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg .

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg .

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units :
 - a. Pressure Class: Positive or negative 2-inch wg.
2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg .

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel or carbon steel coated with zinc-chromate primer.
2. Stainless-Steel Ducts:
 - a. Exposed to Airstream: Match duct material.
 - b. Not Exposed to Airstream: Match duct material.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC

Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

- c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vaness and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.
- G. Branch Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in with damper, with 2" standoff bracket.
 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

- a. Velocity 1000 fpm or Lower: 90-degree tap.
- b. Velocity 1000 to 1500 fpm: Conical tap.
- c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

Not for Construction

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Fire dampers.
4. Ceiling dampers.
5. Smoke dampers.
6. Combination fire and smoke dampers.
7. Turning vanes.
8. Remote damper operators.
9. Duct-mounted access doors.
10. Flexible connectors.
11. Flexible ducts.
12. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 SUBMITTALS

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

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Control damper installations.
 - c. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
 - d. Wiring Diagrams: For power, signal, and control wiring.

- C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60 .
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and exposed ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. METALAIRE, Inc.
 - f. Nailor Industries Inc.
 - g. Pottorff; a division of PCI Industries, Inc.
 - h. Ruskin Company.
 - i. Trox USA Inc.
 - j. Vent Products Company, Inc.
 - 2. Standard leakage rating.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:

- a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
- a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Stainless steel.
7. Bearings:
- a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
- B. Jackshaft:
1. Size: 1-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.3 CONTROL DAMPERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Arrow United Industries; a division of Mestek, Inc.
 3. Cesco Products; a division of Mestek, Inc.
 4. Duro Dyne Inc.
 5. Flexmaster U.S.A., Inc.
 6. Greenheck Fan Corporation.
 7. Lloyd Industries, Inc.
 8. M&I Air Systems Engineering; Division of M&I Heat Transfer Products Ltd.
 9. McGill AirFlow LLC.
 10. METALAIRE, Inc.
 11. Metal Form Manufacturing, Inc.
 12. Nailor Industries Inc.
 13. NCA Manufacturing, Inc.
 14. Ruskin Company.
 15. Vent Products Company, Inc.
 16. Young Regulator Company.

- B. Low-leakage rating and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
- C. Bearings:
 - 1. Molded synthetic.
 - 2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 3. Thrust bearings at each end of every blade.

2.4 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Air Balance Inc.; a division of Mestek, Inc.
 - 2. Arrow United Industries; a division of Mestek, Inc.
 - 3. Cesco Products; a division of Mestek, Inc.
 - 4. Greenheck Fan Corporation.
 - 5. McGill AirFlow LLC.
 - 6. METALAIRE, Inc.
 - 7. Nailor Industries Inc.
 - 8. NCA Manufacturing, Inc.
 - 9. PHL, Inc.
 - 10. Pottorff; a division of PCI Industries, Inc.
 - 11. Prefco; Perfect Air Control, Inc.
 - 12. Ruskin Company.
 - 13. Vent Products Company, Inc.
- B. Type: Static; rated and labeled according to UL 555 by an NRTL.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - 1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
 - 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.

2.5 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Greenheck Fan Corporation.
 4. Nailor Industries Inc.
 5. PHL, Inc.
 6. Ruskin Company.
- B. General Requirements: Label according to UL 555S by an NRTL.
- C. Smoke Detector: Integral, factory wired for single-point connection.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.
- E. Blades: Roll-formed, horizontal, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.
- F. Leakage: Class II.
- G. Rated pressure and velocity to exceed design airflow conditions.
- H. Mounting Sleeve: Factory-installed, 0.052-inch thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone caulking.
- I. Damper Motors: two-position action.

2.6 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Air Balance Inc.; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Greenheck Fan Corporation.
 4. Nailor Industries Inc.
 5. Ruskin Company.
- B. Type: Static; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.
- E. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.
- F. Smoke Detector: Integral, factory wired for single-point connection.

- G. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch thick galvanized steel; with mitered and interlocking corners.
- H. Blades: Roll-formed, horizontal, interlocking, 0.034-inch thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch thick, galvanized-steel blade connectors.
- I. Leakage: Class II.
- J. Rated pressure and velocity to exceed design airflow conditions.
- K. Mounting Sleeve: Factory-installed, 0.052-inch thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- L. Master control panel for use in dynamic smoke-management systems.
- M. Damper Motors: two-position action.

2.7 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ductmate Industries, Inc.
 - 2. Duro Dyne Inc.
 - 3. METALAIRE, Inc.
 - 4. SEMCO Incorporated.
 - 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vaness and Vane Runners," and 2-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall.

2.8 REMOTE DAMPER OPERATORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Pottorff; a division of PCI Industries, Inc.
 - 2. Ventfabrics, Inc.
 - 3. Young Regulator Company.
- B. Description: Cable system designed for remote manual damper adjustment.
- C. Tubing: Brass.
- D. Cable: Stainless steel.

2.9 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Flexmaster U.S.A., Inc.
 5. Greenheck Fan Corporation.
 6. McGill AirFlow LLC.
 7. Nailor Industries Inc.
 8. Pottorff; a division of PCI Industries, Inc.
 9. Ventfabrics, Inc.
 10. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
1. Door:
 - a. Fabricate doors airtight and suitable for duct pressure class. Include permanent label having letters not less than 0.5" high reading: "FIRE/SMOKE DAMPER, SMOKE DAMPER, or FIRE DAMPER" as applicable.

2.10 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd..
 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.

3. Service Temperature: Minus 50 to plus 250 deg F.
- G. High-Temperature System, Flexible Connectors: Glass fabric coated with silicone rubber.
1. Minimum Weight: 16 oz./sq. yd..
 2. Tensile Strength: 285 lbf/inch in the warp and 185 lbf/inch in the filling.
 3. Service Temperature: Minus 67 to plus 500 deg F.
- H. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.
1. Minimum Weight: 14 oz./sq. yd..
 2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
 3. Service Temperature: Minus 67 to plus 500 deg F.
- I. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.11 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2004.
- C. Flexible Duct Connectors:
1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.12 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire and smoke dampers according to UL listing.
- G. Install duct security bars where indicated. Construct duct security bars from 0.164-inch steel sleeve, continuously welded at all joints and 1/2-inch diameter steel bars, 6 inches o.c. in each direction in center of sleeve. Weld each bar to steel sleeve and each crossing bar. Weld 2-1/2-by-2-1/2-by-1/4-inch steel angle to 4 sides and both ends of sleeve. Connect duct security bars to ducts with flexible connections. Provide 12-by-12-inch hinged access panel with cam lock in duct in each side of sleeve.
- H. Connect ducts to duct silencers with flexible duct connectors.
- I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. At each change in direction and at maximum 50-foot spacing.
 - 8. Upstream and downstream from turning vanes.
 - 9. Upstream or downstream from duct silencers.

10. Control devices requiring inspection.
11. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

L. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

P. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped in place.

Q. Connect flexible ducts to metal ducts with clamp plus tape.

R. Install duct test holes where required for testing and balancing purposes.

S. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 -GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Perforated diffusers.
3. Louver face diffusers.
4. Fixed face registers and grilles.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 -PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. Carnes.
 - c. Krueger.
 - d. METALAIRE, Inc.
 - e. Nailor Industries Inc.
 - f. Price Industries.
 - g. Titus.
2. Finish: As indicated in schedules.

2.2 REGISTERS AND GRILLES

A. Fixed Face Register :

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

- a. Anemostat Products; a Mestek company.
- b. Carnes.
- c. Krueger.
- d. Nailor Industries Inc.
- e. Price Industries.
- f. Titus.

2. Frame: 1 inch wide.
3. Mounting Frame: Filter (refer to schedule).
4. Accessory: Filter.

B. Linear Bar Grille :

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

- a. Anemostat Products; a Mestek company.
- b. Carnes.
- c. Krueger.
- d. Nailor Industries Inc.
- e. Price Industries.
- f. Titus.

2. Material: Aluminum.
3. Distribution plenum.
 - a. Internal insulation.
4. Frame: 1 inch wide.
5. Mounting: Countersunk screw.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 -EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as

directed, before starting air balancing.

END OF SECTION 233713

Not for Construction

SECTION 23 8127 - SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Forced air furnaces.
- B. Air cooled condensing units.
- C. Indoor air handler (fan & coil) units for duct connection.
- D. Controls.

1.02 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Includes indoor coil condensate drain, natural gas piping, and heat exchanger drain.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute; 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE Std 15).
- D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Temperatures of the Refrigerant; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2010.
- E. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.
- G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.
- H. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2013.
- I. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- D. Project Record Documents: Record actual locations of components and connections.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Filters: One for each unit.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturers warranty for solid state ignition modules.
- C. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier Corporation: www.carrier.com.
- B. Trane Inc: www.trane.com.
- C. York International Corporation / Johnson Controls: www.york.com.
- D. Rheem.

2.02 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
 - 1. Heating: Natural gas fired.
 - 2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
 - 3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR UNITS FOR DUCTED SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
 - 1. Air Flow Configuration: Upflow.
 - 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
- C. Air Filters: 1 inch (25 mm) thick glass fiber, disposable type arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
 - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
 - 2. Manufacturers: System manufacturer.

2.04 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
 - 1. Comply with AHRI 210/240.
 - 2. Refrigerant: R-410A.
 - 3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
 - 4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

- B. Compressor: Hermetic, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.
- C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
 - 1. Condenser Fans: Direct-drive propeller type.
 - 2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.
- D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
- E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
 - 1. Provide thermostatic expansion valves.
- F. Operating Controls:
 - 1. Control by room thermostat to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).
- G. Mounting Pad: 4" concrete housekeeping pad, minimum 2 inches (100 mm) larger than unit on all sides.

2.05 GAS FURNACE COMPONENTS

- A. Insulation: Foil-faced.
- B. Burner: Atmospheric type with adjustable combustion air supply,
 - 1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
 - 2. Electronic pilot ignition, with electric spark igniter.
 - 3. Combustion air damper with synchronous spring return damper motor.
 - 4. Non-corrosive combustion air blower with permanently lubricated motor.
- C. Burner Safety Controls:
 - 1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
 - 2. Flame Rollout Switch: Installed on burner box and prevents operation.
 - 3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
 - 4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- D. Operating Controls:
 - 1. Cycle burner by room thermostat to maintain room temperature setting.
 - 2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.
- E. Flue Termination: Concentric roof kit.

2.06 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
 - 1. Automatic switching from heating to cooling.
 - 2. Preferential rate control to minimize overshoot and deviation from setpoint.
 - 3. Set-up for four separate temperatures per day.
 - 4. Short cycle protection.
 - 5. Programming based on weekdays, Saturday and Sunday.
 - 6. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

7. Battery replacement without program loss.
8. Thermostat display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Day of week.
 - f. System mode indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.
- C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install gas fired furnaces in accordance with NFPA 54.
- D. Provide vent connections in accordance with NFPA 211.
- E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 26 0010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

1.02 WORK BY OWNER

- A. Security System: Owner will contract with security system vendor under separate contract.
- B. Voice/Data system: Cat 5E/Cat 6 cable from the voice/data boxes back to the IDF or MDF.

1.03 OWNER FURNISHED PRODUCTS

- A. Intercom headend and control station will be furnished by Owner.
- B. Owner will hire a low voltage contractor under a separate contract to install the intercom, voice/data, and CATV cabling. EC will provide boxes and raceways.

1.04 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owners option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work as required.
- C. Schedule of Alternates: See Architectural for Schedule of Alternates.

1.05 REFERENCES

- A. ANSI/NFPA 70 – National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. Code for Safety to Life from Fire in Buildings and Structures.

1.06 SUBMITTALS

- A. Submit under provisions of Section 01 3300.
- B. Proposed Products List: Include products specified in the following Sections:
 1. Section 26 0923 Lighting Control Devices
 2. Section 26 2416 Panelboards
 1. Section 26 2726 Wiring Devices.
 2. Section 26 2813 Fuses.
 3. Section 26 2818 Enclosed Switches.
 4. Section 26 5100 Interior Lighting.
 5. Section 26 5600 Exterior Lighting.
 6. Section 28 3100 Fire Detection and Alarm.
- C. Mark dimensions and values in units to match those specified.

1.07 CLOSEOUT SUBMITTALS

- A. Section 01 7700 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations, configurations, and ratings of equipment and their components as scheduled, specified, and documented. Provide warranty information.
- C. Operation and Maintenance Data: Submit spare parts data listing; source and current prices of

replacement part and supplies; and recommended maintenance procedures and intervals.

1.08 REGULATORY REQUIREMENTS

- A. Conform to applicable Building Code for State of Colorado.
- B. Electrical: Conform to NFPA 70 - 2011 National Electrical Code.
- C. Conform to IFC 2006.
- D. Obtain permits, and request inspections from authority having jurisdiction.

1.09 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner Architect/Engineer before proceeding.

1.10 SEQUENCING AND SCHEDULING

- A. Construct Work in sequence under provisions of Section 01 7010.
- B. Coordinate any electrical shut-downs with the Owner.

PART 2 MATERIALS

2.01 Not Used

PART 3 EXECUTION

3.01 DEVICE MOUNTING SCHEDULE

- A. Dimensions are to center of device unless otherwise indicated. Coordinate outlet locations with all architectural millwork and/or casework elevations. Coordinate device mounting height with wainscoting where provided. Where top of wainscot and device mounting height overlaps, shift device down to provide 50 mm 2 IN gap between top of device and top of wainscot. Not all devices are used.
- B. Mounting heights as indicated below:
 - 1. Flush tumbler switch 1220 mm 48 IN
 - 2. Flush tumbler switch in bathroom and toilets. 1120 mm 44 IN
 - 3. Flush tumbler switches and other control devices above
 - a. Counters 1120 mm 44 IN
 - 4. Dimmer switch 1220 mm 48 IN
 - 5. Receptacle (in offices and corridors) 455 mm 18 IN
 - 6. Receptacle horizontally mounted above counter
 - a. 100 mm 4 IN
 - 1) above backsplash or 100 mm 4 IN above work surface if no backsplash provided unless otherwise indicated.
 - 7. Receptacle (in mechanical equipment rooms) 1220 mm 48 IN
 - 8. Receptacle for electric water cooler center vertically and horizontally behind unit
 - 9. Telephone outlets for desk phone 455 mm 18 IN
 - 10. Telephone outlet for wall mounted phone 1220 mm 48 IN
 - 11. Telephone above counter Locate outlet 100 mm 4 IN
 - a. above backsplash or 100 mm 4 IN above work surface if no backsplash provided unless otherwise indicated.
 - 12. Telephone at counter Locate outlet underneath counter
 - a. 455 mm 18 IN AFF

13. Wall mounted public telephone outlet 1100 mm 44 IN
 14. Exit light (over door trim, center in space) 2285 mm 90 IN
 15. Bracket light above lavatory; bottom of fixture shall be 2.5 mm 1 IN above mirror or 1980 mm 78 IN AFF if no mirror provided.
 16. Data processing outlets 455 mm 18 IN
 17. Clock outlet 2285 mm 90 IN
 18. Speaker volume control 1220 mm 48 IN
 19. Door chime 2135 mm 84 IN
 20. Door pushbutton 1220 mm 48 IN
 21. Fire alarm manual pull station 1220 mm 48 IN
 22. Fire alarm signal device 2030 mm 80 IN
 - a. above highest floor level within space or 150 mm 6 IN below the ceiling, whichever is lower.
 23. Fire alarm annunciator panel (to top) 1830 mm 72 IN
 24. Intercom flush wall control station 1525 mm 60 IN
 25. Intercom wall connector outlet for desk station
 - a. 455 mm 18 IN
 26. Safety switch 1370 mm 54 IN
 27. Panelboard (to top) 1830 mm 72 IN
 28. Motor starter 1370 mm 54 IN
 29. Push button motor control station 1220 mm 48 IN
 30. Classroom clock 2135 mm 84 IN
 31. Gymnasium clock 15' - 0"
 32. Classroom wall intercom speaker 2135 mm 84 IN
 33. Intercom call-in switch 1220 mm 48 IN
- C. Locate exit signs and fire alarm flashing lights so that all are visible from all corridor locations.
- D. Relocate signs as required to resolve conflicts.

END OF SECTION

Not for Construction

SECTION 26 0501 - MINOR ELECTRICAL DEMOLITION

PART 1

1.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents
- C. Beginning of demolition means installer accepts existing conditions.

1.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove abandoned panelboards and distribution equipment.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

1.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION

Not for Construction

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0501 - Minor Electrical Demolition: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.
- F. Section 28 3100 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- F. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- I. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- J. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- K. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Compression Connectors: Provide circumferential type or hex type crimp configuration.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Circuiting Requirements:
 - 1. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- J. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

Not for Construction

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 3100 - Photovoltaic Collectors: Additional grounding and bonding requirements for photovoltaic systems.
- D. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; National Electrical Manufacturers Association; 2007.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

- a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
- F. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
 2. Provide equipment grounding conductor routed with supply conductors.
 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
- H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
- I. Photovoltaic Systems: Also comply with Section 26 3100.
- J. Pole-Mounted Luminaires: Also comply with Section 26 5600.
- ## 2.02 GROUNDING AND BONDING COMPONENTS
- A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.

- 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Burndy: www.burndy.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy: www.burndy.com.
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com.
 - c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
- D. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Erico International Corporation: www.erico.com.
 - c. Galvan Industries, Inc: www.galvanelectrical.com.
 - d. Harger Lightning & Grounding: www.harger.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
- D. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

- 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 0553.

END OF SECTION

Not for Construction

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- D. MFMA-4 - Metal Framing Standards Publication; Metal Framing Manufacturers Association; 2004.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

END OF SECTION

Not for Construction

SECTION 26 0534 - CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); National Electrical Contractors Association; 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2012 (ANSI/NEMA FB 1).
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2013.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2013.
- J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

- B. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- C. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- D. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- E. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- F. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- H. Connections to Vibrating Equipment:
 - 1. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 2. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.

2.02 CONDUIT REQUIREMENTS

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 1/2 inch (16 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use of wire for support of conduits is not permitted.
- G. Connections and Terminations:
 - 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 - 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- K. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

SECTION 26 0537 - BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 2726 - Wiring Devices:
 - 1. Wall plates.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- H. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use suitable concrete type boxes where flush-mounted in concrete.
 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 6. Use shallow boxes where required by the type of wall construction.
 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
 12. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Box Supports:
 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- E. Install boxes plumb and level.
- F. Flush-Mounted Boxes:
 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- G. Install boxes as required to preserve insulation integrity.

- H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- J. Close unused box openings.
- K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- L. Provide grounding and bonding in accordance with Section 26 0526.

END OF SECTION

Not for Construction

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
- B. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- C. Identification for Boxes:
 - 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
- D. Identification for Devices:
 - 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
 - 5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
 - 1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
 - 2. Legend:
 - a. Equipment designation or other approved description.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height:
 - a. Equipment Designation: 1/2 inch (13 mm).
 - 5. Color:
 - a. Normal Power System: White text on black background.
- D. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- E. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- F. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Red text on white background.

2.03 VOLTAGE MARKERS

- A. Minimum Size:
- B. Legend:
- C. Color: Black text on orange background unless otherwise indicated.

2.04 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Interior Components: Legible from the point of access.
 - 6. Boxes: Outside face of cover.
 - 7. Conductors and Cables: Legible from the point of access.
 - 8. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

Not for Construction

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Time switches.
- C. Outdoor photo controls.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0537 - Boxes.
- C. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
- D. Section 26 5100 - Interior Lighting.
- E. Section 26 5561 - Theatrical Lighting: Controls for stage lighting units.
- F. Section 26 5600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
- B. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- G. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- H. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
 - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

- C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 6. Sensitivity: Field adjustable.
 - 7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
 - 8. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
- B. Wall Switch Occupancy Sensors:
 - 1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - c. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
- C. Ceiling Mounted Occupancy Sensors:
 - 1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Finish: White unless otherwise indicated.
 - 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

2.03 TIME SWITCHES

- A. Manufacturers:
 - 1. Intermatic, Inc: www.intermatic.com.
 - 2. Tork, a division of NSI Industries LLC: www.tork.com.
- B. Electromechanical Time Switches:
 - 1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
 - 2. Program Capability:
 - a. Astronomic Time Switches: With same schedule for each day of the week and skip-a-day feature to omit selected days with automatic adjustment for seasonal changes in sunrise and sunset times.
 - 3. Schedule Capacity:
 - a. Astronomic Time Switches: Capable of turning load on at sunset and off at either sunrise or selected fixed time.
 - 4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
 - 5. Input Supply Voltage: As indicated on the drawings.
 - 6. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

2.04 OUTDOOR PHOTO CONTROLS

- A. Manufacturers:
 - 1. Intermatic, Inc: www.intermatic.com.
 - 2. Tork, a division of NSI Industries LLC: www.tork.com.
- B. Button Type Outdoor Photo Controls
 - 1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
 - 2. Housing: Weather resistant polycarbonate.
 - 3. Photo Sensor: Cadmium sulfide.
 - 4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
 - 5. Voltage: As required to control the load indicated on the drawings.
 - 6. Failure Mode: Fails to the on position.
 - 7. Load Rating: As required to control the load indicated on the drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on

wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

H. Occupancy Sensor Locations:

1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

I. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

J. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test time switches to verify proper operation.
- E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
- F. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.03 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

END OF SECTION

SECTION 26 2416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2011.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2013 (ANSI/NEMA PB 1.1).
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 67 - Panelboards; Current Edition, Including All Revisions.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; _____: www.eaton.com.
- B. General Electric Company; _____: www.geindustrial.com.
- C. Schneider Electric; Square D Products; _____: www.schneider-electric.us.
- D. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Load centers are not acceptable.

2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Aluminum.
 - 2. Ground Bus Material: Aluminum.
- D. Circuit Breakers:
 - 1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
- E. Enclosures:
 - 1. Provide surface-mounted enclosures unless otherwise indicated.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
 - 2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 0529.
- E. Install panelboards plumb.
- F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- H. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- I. Provide grounding and bonding in accordance with Section 26 0526.

- J. Install all field-installed branch devices, components, and accessories.
- K. Provide filler plates to cover unused spaces in panelboards.

3.02 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

Not for Construction

SECTION 26 2717 - EQUIPMENT WIRING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0534 - Conduit.
- C. Section 26 0537 - Boxes.
- D. Section 26 2726 - Wiring Devices.
- E. Section 26 2818 - Enclosed Switches.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Wiring Devices: As specified in Section 26 2726.
- B. Wire and Cable: As specified in Section 26 0519.
- C. Boxes: As specified in Section 26 0537.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 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. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

Not for Construction

SECTION 26 2726 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 26 0537 - Boxes.
- B. Section 26 0537 - Boxes.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
- E. NEMA WD 6 - Wiring Device -- Dimensional Specifications; National Electrical Manufacturers Association; 2012.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hubbell Incorporated: www.hubbell-wiring.com.
- B. Leviton Manufacturing Company, Inc: www.leviton.com.
- C. Lutron Electronics Company, Inc: www.lutron.com.
- D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

2.02 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

2.03 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.

- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

2.04 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 WALL DIMMERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.

2.06 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com.
 - 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 - 2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- D. GFI Receptacles:
 - 1. GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
 - 2. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.07 WALL PLATES

- A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.02 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.
- C. Inspect each wiring device for damage and defects.
- D. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- E. Test each receptacle to verify operation and proper polarity.
- F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.03 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

Not for Construction

SECTION 26 2813 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fuses.

1.02 RELATED REQUIREMENTS

- A. Section 26 2818 - Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; National Electrical Manufacturers Association; 2012.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com.
- B. Mersen (formerly Ferraz Shawmut): ferrazshawmut.mersen.com.
- C. Littelfuse, Inc; _____: www.littelfuse.com.

2.02 APPLICATIONS

- A. Service Entrance:
 - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
 - 2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- B. General Purpose Branch Circuits: Class RK1, time-delay.
- C. Individual Motor Branch Circuits: Class RK1, time-delay.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class L Fuses: Comply with UL 248-10.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

Not for Construction

SECTION 26 2818 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2013.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Eaton Corporation; _____: www.eaton.com.
- B. General Electric Company; _____: www.geindustrial.com.
- C. Schneider Electric; Square D Products; _____: www.schneider-electric.us.
- D. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 0529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.02 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

Not for Construction

SECTION 26 5100 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Lamps.
- F. Luminaire accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 0537 - Boxes.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
- D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. Section 26 5561 - Theatrical Lighting: Stage lighting units and associated controls.
- F. Section 26 5600 - Exterior Lighting.

1.03 REFERENCE STANDARDS

- A. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; Illuminating Engineering Society; 2002 (Reaffirmed 2008).
- B. IES LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources; Illuminating Engineering Society; 2008.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- D. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety Code; National Fire Protection Association; 2012.
- H. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- I. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 1. No substitutions will be accepted.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format for proposed substitutions.
 3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS - LUMINAIRES

- A. Substitutions: No substitutions will be accepted.

2.02 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.03 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.04 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- C. Battery:
 - 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.05 EXIT SIGNS

- A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single or double as indicated or as required for the installed location.
 - 2. Directional Arrows: As indicated or as required for the installed location.

2.06 BALLASTS AND DRIVERS

- A. All Ballasts:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.
 - a. Wall Dimmers: See Section 26 2726.

2.07 LAMPS

- A. Lamps - General Requirements:
 - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
 - 2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
 - 3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 - 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.08 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.

- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
 - D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
 - E. Install accessories furnished with each luminaire.
 - F. Bond products and metal accessories to branch circuit equipment grounding conductor.
 - G. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - H. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - I. Install lamps in each luminaire.
- 3.02 CLEANING
- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- 3.03 PROTECTION
- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26 5600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.
- D. Poles and accessories.

1.02 REFERENCE STANDARDS

- A. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; Illuminating Engineering Society; 2002 (Reaffirmed 2008).
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.
- C. IES LM-80 - Approved Method: Measuring Lumen Maintenance of LED Light Sources; Illuminating Engineering Society; 2008.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- E. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; National Electrical Contractors Association; 2006.
- F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2012.
- G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Provide photometric calculations where luminaires are proposed for substitution and 14 day prior approval.
 - 2. Provide structural calculations for each pole proposed for substitution.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.

2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format for proposed substitutions.
3. Lamps: Include rated life and initial and mean lumen output.
4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
 1. Components: UL 8750 recognized or listed as applicable.
 2. Tested in accordance with IES LM-79 and IES LM-80.
 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS

- A. All Ballasts:
 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.04 LAMPS

- A. Lamps - General Requirements:
 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.

2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.05 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Recessed Luminaires:
 1. Install trims tight to mounting surface with no visible light leakage.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Pole-Mounted Luminaires:
 1. Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
 - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
 - 2) Position conduits to enter pole shaft.
 - b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 2. Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. Install lamps in each luminaire.

3.02 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.03 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

Not for Construction

SECTION 27 1005 - STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

1.02 RELATED REQUIREMENTS

- A. Section 26 0534 - Conduit.
- B. Section 26 0537 - Boxes.

1.03 REFERENCE STANDARDS

- A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.
- B. ICEA S-83-596 - Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011 (ANSI/ICEA S-83-596).
- C. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements; Insulated Cable Engineers Association; 2012. (ANSI/ICEA S-90-661)
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; Telecommunications Industry Association; 2012.
- F. TIA-492AAAC-B - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; Telecommunications Industry Association; 2009.
- G. TIA-568-C.1 - Commercial Building Telecommunications Cabling Standard; Telecommunications Industry Association; Rev C, 2009 (with Addenda; 2012).
- H. TIA-568-C.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components; Telecommunications Industry Association; Rev C, 2009.
- I. TIA-568-C.3 - Optical Fiber Cabling Components Standard; Telecommunications Industry Association; 2008 (with Addenda; 2011).
- J. TIA-598-C - Optical Fiber Cable Color Coding; Telecommunications Industry Association; Rev C, 2005.
- K. TIA-606-B - Administration Standard for the Telecommunications Infrastructure; Telecommunications Industry Association; Rev B, 2012.
- L. TIA-607-B - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Telecommunications Industry Association; Rev B, 2012 (with Addenda; 2013).
- M. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- N. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

- O. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- P. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
 - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
 - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 01-3000 - Administrative Requirements, for submittal procedures.
- B. Evidence of qualifications for installer.
- C. Field Test Reports.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
 - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
 - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Cabling and Equipment:

2.02 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
 - 1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
 - 2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
 - 3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
 - 1. Locate main distribution frame as indicated on the drawings.
- C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links". Contractor shall make all final terminations at patch panels and faceplates.

2.03 PATHWAYS

- A. Conduit: As specified in Section 26 0534; provide pull cords in all conduits and bushings on ends of all stub-outs above ceiling.

2.04 COPPER CABLE AND TERMINATIONS

- A. Copper Backbone Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
 - 2. Cable Type: TIA-568 Category 3 UTP (unshielded twisted pair); 24 AWG.
 - 3. Cable Capacity: Quantity of pairs as indicated on drawings.
 - 4. Cable Applications:
 - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
 - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
 - c. CommScope
- B. Copper Horizontal Cable:
 - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568 and listed and labeled as complying with UL 444.
 - 2. Cable Type - Voice and Data: TIA-568 Category 6 UTP (unshielded twisted pair); 23 AWG.
 - 3. Cable Capacity: 4-pair.
 - 4. Jacket Color: Gray
 - 5. CommScope CAT6 Uniprise Solutions #8773814/10 – 6504+ Gray CPK,– 1000'
- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated. Contractor shall make all final terminations at patch panels and faceplates.
- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
 - 1. Performance: 750 mating cycles.
 - 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
 - 3. CommScope Uniprise Solutions #UNJ600-GY/CC0020891/1
- E. Copper Patch Cords:
 - 1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end. Manufacturer: CommScope

2.05 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

- A. Fiber Optic Backbone Cable:
 - 1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
 - 2. Cable Type: Multimode, laser-optimized 50/125 um (OM3) complying with TIA-492AAAC.
 - 3. Cable Capacity: 6 Strand-fiber.
 - 4. Manufacturer: CommScope
- B. Fiber Optic Interconnecting Devices:
 - 1. Connector Type: Type SC.
 - 2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
 - 3. Maximum Attenuation/Insertion Loss: 0.3 dB.
 - 4. Manufacturer: CommScope

2.06 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

- A. Copper Cross-Connection Equipment:

1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
 - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
 - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
 - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - d. Provide incoming cable strain relief and routing guides on back of panel.
 - e. Manufacturer: CommScope
 - B. Fiber Optic Cross-Connection Equipment:
 1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.
 - a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
 - b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
 - c. Provide incoming cable strain relief and routing guides on back of panel.
 - d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
 - e. Provide dust covers for unused adapters.
 - f. Manufacturer: CommScope
 - C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
 1. Do not paint over UL label.
 - D. Equipment Racks and Cabinets: EIA/ECA-310 standard 19 inch (482.6 mm) wide component racks.
 1. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
 2. Cabinets: Steel construction with corrosion resistant finish.
 3. Locks: Keyed alike.
 4. 19"Wx48"Hx24"D Black, 26RMU; Top Panel – Solid; Rail Type – Tapped 12-24, Solid metal door, rear door, wall mount panel – Chatsworth Products Inc. #11840-748
 5. Fan Kit Chatsworth Products Inc. #12804-701, 115vac, black
 6. Filter Kit for Fan; black, Chatsworth Products Inc. #12805-701
 7. Cable Management: Velocity Horizontal Cable Manager, Single Sided, 2U, Black, Chatsworth Products Inc. #13930-702
 8. UPS: City will provide a 2U Eaton UPS
- ## 2.07 COMMUNICATIONS OUTLETS
- A. Outlet Boxes: Comply with Section 26 0537.
 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
 2. Minimum Size, Unless Otherwise Indicated:
 - a. Voice Only Outlets: 4 inch square with mud ring by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
 - b. Data or Combination Voice/Data Outlets: 4 inch square with mud ring by 2-1/8 inch deep (100 by 54 mm) trade size.
 - B. Wall Plates:
 1. 2-Port Ivory L Type Flush Faceplate: CommScope #108168477/M12L-246
 2. 4-Port Ivory L Type Flush Faceplate: CommScope #108168550/M14L-246
 3. Accepts modular jacks/inserts.

2.08 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.

2.09 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Comply with Communication Service Provider requirements.
- B. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
 2. 12 inches (300 mm) from power conduits and cables and panelboards.
 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Provide in conduit within walls and where exposed to possible damage. Cables may be run free-wired in accessible ceilings via J-hooks.
- C. Outlet Boxes:
 1. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of telecommunications outlets provided under this section.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
 2. Do not over-cinch or crush cables.
 3. Do not exceed manufacturer's recommended cable pull tension.
 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
 1. At Distribution Frames: 120 inches (3000 mm).
 2. At Outlets - Copper: 12 inches (305 mm).
 3. At Outlets - Optical Fiber: 39 inches (1000 mm).
- C. Copper Cabling:
 1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
 2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
 3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
 1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
 2. Support vertical cable at intervals as recommended by manufacturer.
- E. Wall-Mounted Racks and Enclosures:
 1. Install to plywood backboards only, unless otherwise indicated.
 2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.
- F. Identification:
 1. Use wire and cable markers to identify cables at each end.
 2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.

3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
 1. Inspect cable jackets for certification markings.
 2. Inspect cable terminations for color coded labels of proper type.
 3. Inspect outlet plates and patch panels for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
 1. Test backbone cables after termination but before cross-connection.
 2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
 3. Category 3 Backbone: Perform attenuation test.
 4. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
 5. Provide owner with printed test results.
- E. Testing - Fiber Optic Cabling:
- F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone. Provide owner with printed test results.

END OF SECTION

DIVISION 31 EARTHWORK
SECTION 31 20 00 EARTH MOVING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

2. Removal and Replacement of Existing Topsoil
3. Excavation, Backfill and Compaction for New Building Foundations
4. Overexcavation
5. Site Grading
6. Trenching
7. Erosion Control

B. Related Sections:

1. Field Engineering: Section 01 71 23
- 3 Mechanical Trenching, Excavation and Backfill: Division 22 and 23
4. Electrical Trenching and Backfill: Division 26

1.02 REFERENCE STANDARDS

Compaction Standards: Standard Proctor Density ASTM D698.

1.03 SUBMITTALS

Quality Control Submittals: Reports of soils testing during construction specified under Article 3.11 will be distributed by the testing laboratory in accordance with Section 01 45 00.

1.04 QUALITY ASSURANCE

A. Testing Agency: Soils testing during construction will be done by an approved testing laboratory selected and paid by the Owner.

B. Geotechnical Engineer: Materials and operations under this Section shall be executed under the observation of a Geotechnical Engineer employed by the Owner who will place qualified personnel on the site during earthwork operations as necessary.

1.05 PROJECT CONDITIONS

A. Test Holes: A series of test holes has been made by Kumar & Associates, Inc. See Document 00 31 19. The log and report is believed to be accurate; however, neither the Owner nor the Architect guarantees the information contained therein nor do they guarantee the conditions indicated to exist at the locations of the test holes will prevail at other locations on the site.

B. Existing Utilities: Protect from damage sewer, water, gas, electric, phone or other pipe lines or conduits encountered during the work. Refer to Section 01 11 13 for Contractor's responsibility to locate all underground and aboveground utilities before construction. If existing utility lines are found to be abandoned and not in use, and after examination by the Owner, remove utilities interfering with the work within area of excavation without extra cost. If such lines are found to be in use, carefully protect and carry on work around them. If Owner deems it advisable to move such lines, Owner will pay cost of moving, providing they are not otherwise addressed in these documents.

C. Bailing or Pumping: Immediately pump or bail out water found in excavations, whether rain or seepage. Excavations must be kept free from water at all times. It shall be the responsibility of the Contractor to take measures and furnish equipment and labor necessary to control the flow,

drainage and accumulation of water as required to permit completion of the work under this Section and to avoid damage to the work.

PART 2 - PRODUCTS

2.01 FILL AND BACKFILL MATERIAL

- A. Use imported and on-site excavated material that is acceptable to the Geotechnical Engineer.
- B. Contractor shall notify Geotechnical Engineer when excavation operations are underway so Geotechnical Engineer can evaluate and identify suitable on-site material. Acceptable fill material shall be stockpiled on-site for use during backfill operations. Geotechnical Engineer shall identify on-site material suitable for structural fill (beneath slabs-on-grade and pavements) and on-site material suitable for other fill.
- C. There may not be a sufficient quantity of on-site material is that is acceptable to the Geotechnical Engineer for fill and back fill on the site. Therefore, the import of material may be required. The import or export of material shall be accomplished at no additional cost to the Owner.
- D. Imported fill and backfill material shall have the following characteristics:
 1. Fill within building footprint and pavement areas:
 - a. Material should consist of a nonexpansive granular soil, consisting of a minus 2-inch material that has a maximum 30% passing the No. 200 sieve, and a maximum liquid limit of 30, and a maximum plasticity index of 10.
 2. Fill at utility trench backfill:
 - a. Material excavated from the utility trenches may be used for backfill provided it does not contain unsuitable material or particles larger than 2 inches.
 3. All fill material shall be free of vegetation, brush, sod, and other deleterious substances. Fill should not contain concentrations of organic matter or other deleterious substances.
- E. Submit sample of proposed import material to the Geotechnical Engineer for approval at least 72 hours before starting fill operations. Do not start fill operations without written approval of imported fill material and written direction to proceed.

2.02 TOPSOIL

- A. Use on-site material stripped from the site during site clearing and stockpiled for later use that is acceptable to the Architect.

PART 3 - EXECUTION

3.01 SITE CLEARING

- A. Clearing and Grubbing: Remove surface vegetation, shrubs, and trees in areas disturbed by construction or site grading, including large root structures, and remove from the site.
- B. Existing Topsoil: Remove topsoil from areas disturbed by construction or site grading. Stockpile on site for reinstallation after construction is complete. Stockpile may contain moderate amounts of grassy material but shall not contain organic material that will not decay during the period of stockpiling.

3.02 EXCAVATION

- A. Foundations: Excavate as required for walls, foundations, piers, floor areas, pits, etc., to depths indicated on the drawings.

- B. Floors: Existing fill shall not be relied on for support of floor slabs. Any encountered below the proposed floor slab elevation shall be removed and replaced with structural fill.
 - C. If, through error, excavations for foundations, walls, etc., are carried deeper than required, excess depth shall be filled with compacted fill as directed, at the Contractor's own expense.
 - D. If debris, soft spots, loose natural granular material or excessively moist areas are uncovered at foundation excavation they shall be immediately reported to the Geotechnical Engineer who will determine if corrective work is necessary. Such corrective work shall be reimbursed by Change Order.
 - E. Site Excavation: Excavate the site as required for finish grading specified under Article 3.09.
 - F. Cobbles and Boulders: Where cobbles or boulders are uncovered at finish elevation they shall be immediately reported to the Architect and Geotechnical Engineer who may direct their removal. If so directed, cobbles or boulders shall be carefully removed to prevent disturbance of adjacent soils and the resulting depressions shall be filled with compacted earth fill. Remove from the site.
 - G. Rock Excavation: Rock shall be defined as material that tests up to and including 50 blows per 1" as described in the soils report. Rock as defined above shall be considered normal excavation and no extra will be allowed. Work to remove any rock material harder than 50 blows per 1" will be a change order to the contract.
 - H. **Portions of utility trenching may require jack hammering or other special equipment to complete. Such measures, as required, are to be included in the base bid.**
- 3.03 PREPARATION OF NATURAL GROUND
- A. General: Remove frozen or muddy ground in fill areas. Dewater areas to receive fill as required for proper compaction operations before starting fill operations.
 - B. Scarification: Scarify to a minimum depth as indicated below, then compact and moisture condition to limits indicated in 3.05C and 3.05D.
 - 1. Beneath Floor Slabs: eight (8) inches.
 - 2. Beneath Footings: twelve (12) inches.
 - 3. Beneath Pavements: twelve (12) inches.
 - B. Proof Rolling: Natural soil supporting paving and building slab-on-grade shall be proof rolled by heavy rubber tired equipment acceptable to the Geotechnical Engineer. Any exceptionally loose or soft pockets revealed by proof rolling shall be reported to the Geotechnical Engineer who will determine if corrective work is required. Such corrective work shall be reimbursed by Change Order.
- 3.04 PREPARATION OF FOOTING EXCAVATIONS
- Compact bottom of all footing excavations to the satisfaction of the Geotechnical Engineer using a smooth vibratory compactor immediately prior to forming.
- 3.05 FILL AND BACKFILL
- A. At proper time, backfill around walls, etc., as required to bring the earth to proper levels and grades for subsequent work. Install backfill in even lifts on both sides of foundation walls to prevent excessive pressure on one side.
 - B. Placing Fill and Backfill: No brush, sod, frozen material or other perishable or unsuitable materials shall be placed in the fill. Distribute fill material to avoid formation of lenses differing

substantially from the surrounding material. Deliver materials to the fill surface in a manner to result in a well and uniformly compacted fill. Before compaction spread fill materials in approximately horizontal layers not greater than 8" thick and upper surface approximately horizontal. Distribute allowed cobbles uniformly in the fill material as directed by the Geotechnical Engineer.

C. Moisture Control:

1. The Contractor may be required to add necessary moisture to the fill material in the excavation if, in the opinion of the Geotechnical Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. If, in the opinion of the Geotechnical Engineer, the material proposed for use in the compacted fill is too wet to permit adequate compaction, it shall be dried in an acceptable manner prior to placement and compaction.
2. Level of moisture content shall be as follows:
 - a. Beneath Foundations: near optimum.
 - b. Beneath Floor Slabs: near optimum.
 - c. Beneath Pavements and Exterior Flatwork: near optimum.
 - e. Foundation Wall Backfill: near optimum.
 - e. Landscaped Areas: near optimum.

D. Compaction:

1. When an aggregate, uniform moisture content is obtained, compact each layer by mechanical method acceptable to the Geotechnical Engineer to the following densities as determined by the Standard Proctor Test (ASTM D698). The use of free water (puddling) will not be allowed:
2. Level of compaction shall be as follows:
 - a. Beneath Foundations: 98% minimum
 - b. Beneath Floor Slabs: 95% minimum.
 - c. Beneath Pavements and Exterior Flatwork: 95% minimum.
 - e. Foundation Wall Backfill: 95% minimum.
 - e. Landscaped Areas: 95% maximum.

E. At areas to be Landscaped, take all necessary precautions to limit construction traffic so as not to exceed 95% compaction. Should Landscape subgrade be compacted to levels greater than 95%, they shall be scarified to minimum depth of 12" and reworked with compaction not exceeding 95%.

F. Backfill Cap: In areas of backfill at perimeter of building not covered with sidewalks or paving. Top two feet of backfill shall consist of impervious material compacted to same density as remaining backfill.

3.06 DAMAGED EARTH

Earth that has been rendered unfit to receive planting due to concrete water, mortar or lime water dumped on it, shall be removed from the site and replaced with clean earth.

3.07 UNSUITABLE OR EXCESS MATERIAL INCLUDING COBBLES AND BOULDERS

Dispose of off-site.

3.08 UNSUITABLE BEARING MATERIAL

A. Pockets of soft material or cobbles may be found within the building or paving areas. Where such areas are found, the Geotechnical Engineer may order them removed and replaced with compacted earth fill as specified under Article 3.05. Fill material shall be imported or on-site material suitable to the Geotechnical Engineer.

- B. Contractor shall keep a complete and accurate record of any work thus performed. At the completion of excavation, a change order will be issued reimbursing him for additional work thus performed. Unsuitable materials removed shall be disposed of off-site.
- 3.09 GRADING
- A. Cut and fill areas as indicated or required to finish grades indicated. Leave graded surface clean, free from rubbish and large clods, and smooth.
- B. Import material necessary to achieve finish grades indicated on drawings at no additional cost to Owner.
- C. Grading Tolerances as follows: Reference Field Engineering - Section 01 71 23.
- 3.10 TOPSOIL
- A. Subgrade to receive topsoil shall not be compacted greater than 95%. Before placement of topsoil, confirm that subgrade compaction is acceptable. Refer to Article 3.05, C for additional information.
- B. Spread stockpiled topsoil to even depths of 4" over all graded areas not covered by concrete or asphalt paving, buildings, sidewalks or gravel surfacing. No noxious weeds or parts thereof shall be present in the surface grade after placement.
- C. Rake to a smooth, even surface free of debris, clods, rocks or vegetable matter greater than 1/2".
- D. Topsoil not used shall remain in the stockpile as the property of the Owner.
- 3.11 FIELD QUALITY CONTROL
- A. Engineer's Approval: Contractor shall obtain the Geotechnical Engineer's approval of the method of placing and compaction before starting compacted fill or backfill.
- B. Obtain written approval of the completed compacted fill or backfill from the Geotechnical Engineer who will make sufficient tests, at the expense of the Owner, to assure compliance with these Specifications. If, because of unsatisfactory test results, it is necessary to retest after corrective work by the Contractor, the cost of all tests other than the initial tests shall be paid by the Contractor.
- C. Moisture-Density Determination: Samples of representative fill materials to be placed shall be supplied to the Geotechnical Engineer for determination of maximum density and optimum moisture for these materials. Unless indicated otherwise, tests for this determination will be made using methods conforming to requirements of ASTM D-698. A copy of the test results will be the basis of control for compactive effort.
- D. Density Tests: The density and moisture content of compacted fill will be determined by the Geotechnical Engineer in accordance with ASTM D1556, D2167, D2922, or D3017. Any material found to not comply with the minimum specified density shall be recompacted until the required density is obtained.
- E. Field Engineering: See Section 01 71 23 for requirements.
- 3.12 EROSION CONTROL
As indicated on Grading Plan and as required by local jurisdiction.

END OF SECTION

SECTION 31 23 16 EARTHWORK
DIVISION 31-PAGE 1 TRENCH EXCAVATION AND BACKFILLING

PART 1 – GENERAL

This Section specifies requirements for excavating trenches and backfilling for installation of pipelines, sewers, conduits and appurtenances. The contractor shall follow the “Water Line Extension and Service Standards” by Colorado Springs Utilities, The CDOT Colorado Highway Specifications, The City of Colorado Springs Standard Specifications, and OSHA Guidelines. These standards shall govern if there is a conflict between the following specifications and the standard specifications.

1.1 RELATED WORK

- A. Hauling and Haul Roads Section 01 53 40
- B. Tree and Shrub Preservation Section 32 93 50
- C. Water Mains Section 33 11 17
- D. Boring or Jacking Conduits Section 33 71 15

1.2 PROTECTION

- A. Existing Buried Utilities
 - 1. Size, depth and location of existing utilities shown on Drawings are for guidance only; completeness and accuracy are not guaranteed. Contractor is responsible for locating and verifying locations of all existing underground utilities. Contractor may need to pothole and determine existing locations of utility crossings and connection points prior to construction to ensure that the existing utilities are where shown on the existing plans.
 - 2. Prior to commencing any excavation work, notify the applicable utility authorities and establish location and state of use of buried services. Clearly mark such locations to prevent disturbance during work.
 - 3. Maintain and protect from damage, water, sewer, gas, electric, or other utilities encountered.
 - 4. Obtain written authorization of owner of utility and Engineer before moving or otherwise disturbing utility.
- B. Existing Surface Features
 - 1. Protect existing buildings, trees and other plants, lawns, fencing, service poles, wires or paving located within right of way or adjoining properties from damage while work is in progress. Repair to Engineer's satisfaction any damage which may occur.
 - 2. Where excavation necessitates root or branch cutting, do so only under direct control of the Engineer.
 - 3. Protect existing trees and shrubs in accordance with Section 32 93 50.

Deerfield Hills Community Center
Addition/Renovation

LKA Project No. 15-003

C. Shoring and Bracing

1. Whenever shoring, sheeting, timbering and bracing of excavations is required, engage services of a Professional Engineer to design and assume responsibility for adequacy of shoring and bracing. Professional Engineer is to be registered in Colorado.
2. For all proposed utilities, submit for review Shop Drawings, where necessary and requested by the owner or engineer or architect provide calculations signed and stamped by the Professional Engineer responsible for their preparation.
3. Close sheeting, when required, to be designed and constructed to prevent adjacent soil or water from entering excavation.

D. Access

1. Maintain unobstructed access to fire and police appurtenances, telephone, electric, water, sewer, gas or other public utilities and private properties.

E. Flooding

1. Protect open excavation against flooding and damage from surface water run-off.

1.3 SAFETY REQUIREMENTS

- A. Adhere to Municipal and State requirements relating to safety of trenching work, including shoring and bracing as required.
- B. Adhere to all crossing permit (railway, pipeline, telecommunications duct, etc.) requirements.
- C. Provide barricades, flares, etc. to adequately denote area of excavation adjacent to roadways. Traffic control to be in accordance with Section 01 35 14.

PART 2 – PRODUCTS

See Colorado Springs Utilities Water Line Extension and Service Standards

PART 3 – EXECUTION

3.1 SITE PREPARATION

- A. Remove trees, shrubs, vegetation, fences and other obstructions including ice and snow, from surfaces to be excavated within limits indicated. Provide traffic control and erosion control.
- B. Strip top soil from within limits of excavation and stockpile as directed, for re-spreading after backfilling.

3.2 DEWATERING

- A. Keep excavations dry while work is in progress.
- B. Dispose of water in a manner not detrimental to public health, environment, public and private property, or any portion of work completed or under construction. (Refer to Section 01 35 43).

3.3 EXCAVATION

Deerfield Hills Community Center
Addition/Renovation

LKA Project No. 15-003

- A. Excavate to lines, grades, elevations and dimensions indicated on Drawings. Ground profiles are approximate only. Precise line and grade will be set out by Engineer. Allow Engineer two working days advance notice to set out line and grade.
- B. Cut pavement or sidewalk neatly along limits of proposed excavation.
- C. Where edge of existing pavement is damaged as a result of trench excavation in shoulder, a minimum 1 foot width to be cut neatly and continuously and reinstated in accordance with Clause 3.9 of this section, (Restoration). Any existing pavement disturbed shall be replaced per the plans or in kind by the contractor at no additional charge.
- D. Notify Engineer when soil at proposed elevation of trench bottom appears unsuitable for foundation of installation. Remove unsuitable material and replace with approved bedding.
- E. Notify Engineer if new construction conflicts with discovered obstruction. Allow Engineer sufficient time to consider alternative alignment to avoid conflict with obstruction. Modify alignment as directed by Engineer.
- F. Unless otherwise authorized by Engineer, do not excavate more than 100 feet of trench in advance of installation operations and do not leave open more than 50 feet of open trench at end of days operation.
- G. Stockpile suitable excavated materials required for trench backfill in approved location and provide adequate erosion control for all trenching operations per state guidelines.
- H. Dispose of surplus and unsuitable material at a waste site designated by Engineer or a site located by Contractor and approved by Engineer.
- I. Do not obstruct flow of surface drainage or natural watercourses.
- J. Follow recommendations of the soils report..

3.4 BACKFILLING

- A. Follow City of See City of Colorado Springs Utilities Water Line Extension and Service Standards.

3.5 RESTORATION

- A. Upon completion of backfilling, the surface shall be restored fully to a condition at least equal to that which existed before construction. Final grades in unimproved areas will match existing grades at construction limits without producing drainage problems. Restoration of native grasses will be necessary unless otherwise specified. Restoration of sod, shrubs, trees and other landscaping will be at the Contractor's expense. All sod, shrubs, trees and other landscaping will be replaced with material of equal or better size and quality. Reseeding of sodded areas will not be allowed unless so specified. All work within improved areas will be in accordance with Section 01 74 11. The cost of replacement work and removal of all debris from the site of the work will be at the expense of the Contractor.

END OF SECTION

**Deerfield Hills Community Center
Addition/Renovation**

LKA Project No. 15-003

Not for Construction

SECTION 32 12 16 ASPHALTIC CONCRETE PAVING PATCHING

PART 1 – GENERAL

1.01 SUMMARY

- A. Section Includes Asphalt Paving For:
1. Asphalt Patching

1.02 SUBMITTALS

Quality Control Submittals: Prior to starting asphalt work, submit asphalt concrete mixes to the Architect for approval. Include all information used in designing mixes.

1.03 QUALITY ASSURANCE

Regulatory Requirements: Comply with Section 400 - Pavements, Section 702 - Bituminous Materials, and Section 703 - Aggregates, of the Colorado Department of Transportation Standard Specifications for Road and Bridge Construction, 2005 Edition, made a part of these Specifications by reference.

PART 2 - PRODUCTS

2.01 BASE COURSE MATERIAL

Material shall be crushed stone, crushed slag, crushed gravel, or native gravel which conforms to the Colorado Department of Transportation Standard Specifications for Class 5 or Class 6 base course.

2.02 PRIME COAT/TACK COAT

Grade CSS-1h Emulsified Asphalt as defined by Section 702 Colorado Department of Transportation Standard Specifications.

2.03 ASPHALTIC CONCRETE MIXTURE

Grades S and SX as defined by Colorado Department of Transportation Standard Specifications. Use Grade SX for top surface course and Grade S for bottom lifts. Reclaimed asphalt material allowed only to the extent specified in the referenced State of Colorado Standards.

2.04 PRE-EMERGENT

BASF, Sahara DG, preemergent or approved substitute preemergence herbicide specifically for use beneath pavements.

PART 3 – EXECUTION

3.01 PREPARATION (Patching)

- A. Completely remove pavement material back to a clean, straight, saw cut edge.

3.02 PREPARATION OF SUBGRADE

- A. Cut or fill and finish grade as required to bottom of asphalt pavement or aggregate base course within a tolerance of plus or minus 0.02' (1/4"). If fill is required, use on-site select fill material or imported structural fill material as compacted to at least 95% of Standard Proctor Density, ASTM D698 within plus or minus 2% of optimum moisture content.

3.03 PAVEMENT DESIGNS

Match existing sub grade and pavement thickness. No single lift of asphalt shall exceed 3" in thickness.

3.04 PREEMERGENT

Immediately prior to application of aggregate base course material or full depth asphalt, apply preemergent to sub grade as recommended by the manufacturer for below pavement applications. Take extreme care not to sterilize the adjacent non-paved area.

3.05 PLACEMENT OF AGGREGATE BASE COURSE

- A. Hauling and Placing: Exercise care in the hauling and placing of base course to avoid segregation of the coarse and fine materials. Place base course material on the previously prepared subgrade in sufficient quantity to conform to the thickness specified. The material shall be mixed and watered to obtain a uniform mixture at optimum moisture.
- B. See Article 3.03 for aggregate base course thickness.
- C. Place and compact within plus or minus 2% of optimum moisture content. Continue compaction until the base course has a density of not less than 100% of Standard Proctor Density according to ASTM D698.
- D. Surface and Thickness Tolerances: The subgrade of the prepared base course material shall be free from depressions exceeding 3/16" in 10' when measured with a straightedge. The surface shall be smooth and true to the established crown and grade. Any areas not complying with these tolerances shall be reworked to conform.

3.06 PRIME COAT APPLICATION

- A. General: Prime prepared surfaces of aggregate base course with an emulsified asphalt in accordance with these Specifications. Omit prime coat at full depth asphalt.
- B. Surface Preparation: Before applying the prime coat, remove all loose material from the surface. That portion of the surface prepared for treatment shall be dry and in satisfactory condition.
- C. Placing: Place prime coat by means of an approved pressure distributor capable of applying the prime coat uniformly to the surface to be treated in the required quantity. Apply at the rate of 0.1 gallon per square yard.
- D. Do not apply prime coat when the surface is wet or when the atmospheric temperature is less than 40 degrees F., or when precipitation is imminent.
- E. Carefully apply the prime coat. If adjacent surfaces, other than abutting edges of curbs, are sprayed with liquid asphalt, they shall be cleaned at the Contractor's expense. Allow prime coat to cure for a minimum of 24 hours prior to the paving operation. Contractor will be held responsible for any damage resulting from cleaning operations to curb, sidewalk or other structures.

3.07 PLACEMENT OF ASPHALTIC CONCRETE

- A. Tack Coat: Apply tack coat of emulsified asphalt to edge of curb and all other concrete surfaces adjoining asphalt paving.
- B. Comply with requirements of Section 400, Colorado Department of Transportation Standard Specifications.
- D. Second and third lifts, if required, must be placed within 48 hours of preceding lift or a tack coat will be required.

- E. Consolidation: Consolidate asphalt to 92% to 96% of maximum theoretical density (ASTM D2041). Each finished compacted lift must be not less than the specified design lift thickness.
- F. Tolerances: Finished asphalt surface shall be free from depressions exceeding 3/16" in 10' when measured with a straightedge. The surface shall be smooth and true to the established crown and grade. Any areas not complying with these tolerances shall be reworked to conform.

END OF SECTION

Not for Construction

SECTION 32 16 00 SITE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Concrete Sidewalks
2. Sidewalk Trench Drainage Pans

B. Products Installed But Not Furnished Under This Section:

1. Railing Sleeves: Furnished under Section 05 50 00
2. Sidewalk Trench Drain Covers: Furnished under Section 05 50 00

C. Related Sections:

1. Earthwork: Section 31 20 00
2. Concrete Reinforcing: Section 03 20 00
3. Cast-in-Place Concrete: Section 03 30 00
4. Joint Sealers: Section 07 92 00
5. Field Engineering: Section 01 71 23

1.02 SUBMITTALS

Quality Control Submittals:

1. Mix Designs: Prior to placing any concrete, the Contractor shall submit concrete mixes to the Architect for approval. Separate mix designs shall be submitted for each type of concrete to be used in the project. Submittals shall include all information used in designing the mixes in accordance with Section 03 30 00.
2. Test Reports: Reports of control tests, special tests, or core tests specified under Section 03 30 00, shall be distributed by the testing laboratory as specified in Section 01 45 00.
3. Record of Work: A record shall be kept by the Contractor listing the time and date of placement of concrete. Such record shall be kept until the completion of the project and shall be available to the Architect for examination at any time.

1.03 PROJECT CONDITIONS

- ##### A. Cold Weather Placement:
- When placing concrete after the first frost or when the mean daily temperatures are below 40 degrees F., follow recommendations of ACI 306. Maintain concrete temperature at a minimum of 50 degrees F. for not less than 72 hours after placement. Place no concrete on days when the temperature at 9:00 A.M. is below 30 degrees F. until the Contractor has taken all necessary precautions and supplied all the necessary equipment to prevent the concrete from freezing.
- ##### B. Hot Weather Placement:
- When placing concrete in hot weather, follow recommendations of ACI 305R. The optimum temperature of concrete at time of placement shall not exceed 85 degrees F. Protect concrete to prevent rapid drying. Start finishing and curing as soon as possible after placement. When the air temperatures are expected to exceed 90 degrees F. utilize appropriate procedures in protecting, placing, finishing, and curing of concrete. Pozzolite Retarder, as manufactured by Master Builders Company, Cleveland, Ohio, may be used upon approval of the Architect. The use of continuous fog sprays may be required by the Architect for 24 hours after placement, or the work may be restricted to evening or nights, especially during times of low humidity.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

Use ready mixed concrete conforming with ASTM C94. No on-job mixed concrete will be allowed. See Section 03 30 00 for Mix Designs.

2.02 MISCELLANEOUS MATERIALS

- A. Curing Compound: Conform to ASTM C309, Type 1, clear or translucent.
- B. Reinforcing: 6 x 6 x W1.4 x W1.4 welded wire fabric conforming to ASTM A185 (flat sheets only), as specified in Section 03 30 00.
- C. Expansion Joint Filler: 1/2" thick bituminous fiber type complying with ASTM D1751.
- D. Poured Joint Sealer: As specified in Section 07 92 00.

PART 3 - EXECUTION

3.01 EXAMINATION

Provide 24 hours minimum notice to Architect to allow examination of forms and reinforcement before concrete is placed.

3.02 PREPARATION

Do not begin concrete work until operations are completed enough to allow placement to be carried on as a continuous operation for the entire section that is to be placed. Clean equipment for mixing and transporting the concrete. Forms shall be cleaned of all debris and ice and shall be wetted (except in freezing weather) and coated as specified under Section 03 30 00. If water accumulates in the forms, it shall be pumped out before concrete is placed. The finished top surface of vertical members shall be clearly marked on the form walls. Where new curb and gutter abuts existing asphalt paving, cut asphalt to a straight line and pour toe to gutter against asphalt to avoid necessity of patching asphalt.

3.03 SUBGRADE

Cut or fill and finish grade as required to bottom of sidewalk or curb and gutter within a tolerance of $\pm 0.02'$ (1/4") and as specified in Section 31 20 00.

3.04 CONCRETE PLACEMENT

- A. Placement: Piling up of the concrete in the forms or chuting in a manner that separates the aggregates will not be permitted.
- B. The recommendation of ACI 614 shall be followed for placing concrete into forms. No concrete shall be dropped over five (5) feet. Accumulations of water on the surface of the concrete due to water gain, segregation, or other causes, during placement or consolidation shall be prevented as far as possible by adjustments in the mixture.
- C. Consolidation: Consolidate concrete during and immediately after placement by means of mechanical vibrators. Supplement by hand spading at corners and angles of the forms, around embedded fixtures and in other difficult areas.

3.05 FINISH AND JOINTS

- A. Concrete Finish: All exterior concrete, including stairs, shall be broom finished. Finish edges at joints with a slightly rounded edging tool. Retool edges and joints after brooming for smooth "picture frame" appearance on each stone. Width of smooth edge shall be consistent throughout project.
- B. Finish shall be true flat planes within 1/4" in 10 feet as determined by a 10-foot long straightedge placed anywhere on the surface in any direction.

- C. Thickness: Sidewalks shall be full uniform thickness of four (4) inches unless indicated otherwise on the drawings. Curb and gutter thickness shall be as indicated on the drawings.
- D. Joints:
1. Contraction (score) Joints: Space eight (8) feet on center in flatwork and ten (10) feet on center in curb and gutter unless shown otherwise on the drawings. Joint spacing shall maintain no greater than a 25% difference in length when both longitudinal and transverse joints are required. Contraction joints shall be cut 1/3 the depth of the slab, 1/8" in width, 1/4" radius tooled edges.
 2. Construction Joints: Place at forty (40) foot intervals, unless shown otherwise on the drawings. Top surface of the joint should resemble a contraction joint with a one (1) inch depth.
 3. Isolation/Expansion Joints: Provide expansion joints one hundred twenty (120) feet on center, at all fixed structures, at non-symmetrical intersections, and at other locations indicated on Drawings. Expansion joints shall extend through the entire slab with bituminous fiber expansion joint filler. Hold top of joint filler down or use removable zip-strip on top of filler at joints to allow specified depth of sealant joint in accordance with Section 07920. Isolation/Expansion joints in curb and gutter are required at all fixed structures, at non-symmetrical intersections, and at other locations indicated on Drawings.

3.06 CURING

- A. General: Do not remove forms until such time has elapsed as specified in Section 03100. Remove forms carefully to avoid damage to the concrete surface.
- B. Clean concrete surfaces of loose sand, mortar, debris, and grout; spray surface lightly with water and coat with curing compound as soon as possible after removing forms. Apply curing compound the same working day that the concrete is finished or forms are removed. Special attention shall be given to securing adequate curing of concrete edges.

3.07 INSTALLATION OF EMBEDDED ITEMS

Sidewalk Trench Covers, Anchors, Stair Nosings, and Sleeves: Install items furnished under other sections in accordance with shop drawings.

3.08 BACKFILLING

Backfill against all work following removal of forms. Fill level with surrounding area and compact. Final grade tolerance $\pm 0.1'$ (1-1/4").

3.09 FIELD QUALITY CONTROL

- A. General: All testing shall be done by a testing laboratory selected and paid by the Owner in accordance with Section 01 45 00.
- B. Test Priority: Control tests shall be used to determine the concrete quality throughout the project, however, special tests shall have precedence over control tests, and core tests shall have precedence over previous tests.
- C. Slump Tests: The Contractor shall provide necessary equipment and make tests in conformity with ASTM C143, as frequently as required by Section 03 30 00. The tests shall be made by a person thoroughly familiar with the requirements specified. Should the slump exceed the limits specified in Section 03 30 00, the batch shall be rejected. The Contractor shall keep an accurate record of the time, location of the work, and the results of slump tests, which shall be made available for review by the Architect.
- D. Control Tests: See Section 03 30 00.

3.10 PROTECTION

- A. Protect exposed surfaces of concrete from premature drying and frost. Protect freshly placed concrete against rain damage.
- B. Protect concrete surfaces from staining, cracking, chipping, and other damage during progress of work. Leave concrete surfaces in good condition upon completion.

END OF SECTION

Not for Construction

SECTION 32 17 23 PAVEMENT MARKING

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Layout and Painting of lines on pavement as indicated.
2. Layout and application of Preformed Plastic pavement marking tape for pedestrian crosswalk on pavement as indicated.

1.02 QUALITY ASSURANCE

Qualifications: Pavement marking shall be done by a contractor regularly engaged in this type of work and with proper equipment for a striping job of this size.

1.03 SUBMITTALS

- A. Product Data: Submit to the Architect for approval.
- B. Letter of Compliance: Submit letter from marking paint manufacturer stating compliance with referenced Colorado Department of Transportation Standard Specifications.

1.04 PROJECT CONDITIONS

Environmental Requirements: Pavement marking shall not be done in wet weather or when the temperature is below or above that recommended by the manufacturer. Pavement surface conditions must be as recommended by manufacturer of marking paint and / or tape.

PART 2 - PRODUCTS

2.01 MARKING AND STRIPING PAINT

Solvent based paint with pigment and vehicle composition complying with Colorado Department of Transportation Standard Specifications, Section 708.05. White and blue, as indicated on the drawings.

PART 3 - EXECUTION

3.01 MARKING PAINT STRIPING

- A. Layout and paint lines on pavement where indicated on the drawings.
- B. Parking lot lines shall be width indicated on the drawings, and painted by a mechanical striping machine after the paving is swept clean.
- C. Lines and other markings shall be applied in sufficient quantity to produce a complete opaque line. Thickness of paint shall comply with Colorado Department of Transportation Standard Specifications.

END OF SECTION

SECTION 32 32 00 NATURAL STONE RETAINING WALL

PART 1 – GENERAL

1.01 SUMMARY

Section Includes: Labor and material to furnish and install natural stone retaining wall system.

1.02 SUBMITTALS

Submit samples of the natural stone. Stone shall be granite, reddish in color with lighter and darker aggregates similar to stone at existing on-site retaining walls. Size Height 8"-12", Width 8"-16".

1.03 JOB CONDITIONS

A. Environmental Requirements:

Cold Weather Protection: Before beginning work, remove ice or snow formed on gravel bed by carefully applying heat until top surface is dry to touch.

B. Protection of Completed Work from Physical Damage: Protect wall from damage. Replace stones units showing damage or disfiguration during the progress of work in its entirety.

PART 2 - PRODUCTS

2.01 GRANITE

A. Stones shall be free from seams and other defects. Consistent variegation is acceptable.

B. Compacted Gravel Base: Crushed Limestone or other stone material acceptable to the installer.

PART 3 - EXECUTION

3.01 PREPARATION

Surface Preparation: Dig trench approximately 6" deep and 12" wide. Place bottom course of wall system on compacted gravel fill 3-4" deep.

3.02 ERECTION

A. General: Sort the stone in piles to like thicknesses. Use the thickest and longest stones for the first course. Make sure the first course is level, install subsequent layers level, making sure to setback each additional course ½" (batter). Running bond. Do not stack vertical joints. Finish top of wall with flat stones, fit together tightly. Backfill and compact.

3.03 ADJUSTING AND CLEANING

A. Remove defective units and replace with new undamaged units.

B. Upon completion of work, leave the area and surrounding surfaces clean and free of broken stones.

END OF SECTION

Deerfield Hills Community Center

LKA Project No. 15-003

Addition/Renovation

SECTION 33 10 00 UTILITIES
DIVISION 33- PAGE 1 WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to both new building service lines and to existing water supply.

1.2 RELATED WORK:

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Excavation, trench widths, pipe bedding, backfill, shoring, sheeting, bracing: Section 31 20 00, EARTH MOVING.
- C. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Protection of materials and equipment: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Fire protection system connection and supervisory switch for post indicator valve: Section 21 12 00, FIRE-SUPPRESSION STANDPIPES.
- F. Fire protection system connection, Section 21 10 00, WATER-BASED FIRE-SUPPRESSION SYSTEMS.

1.3 DEFINITIONS:

- A. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout building areas and other areas of water use, including hydrants, valves, and other appurtenances used to supply water for domestic and fire-fighting/fire protection purposes.
- B. Water Service Line: Pipe line connecting building piping to water distribution lines.

1.4 QUALITY ASSURANCE:

- A. Products Criteria:
 - 1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be product of one manufacturer.
 - 2. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

Deerfield Hills Community Center

LKA Project No. 15-003

Addition/Renovation

- B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems. All installation, materials, testing, and equipment shall conform to the Colorado Springs Utilities Water Line Extension Standards and Specifications.
- C. Comply with all rules and regulations of Federal, State, and Local // Health Department // Department of Environmental Quality // having jurisdiction over the design, construction, and operation of potable water systems.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data (Submit all items as one package):
 - 1. All equipment, valves, bends, pipes, fire hydrants, and cathodic protections shall be submitted to the engineer for review prior to installation.
- C. Testing Certifications:
 - 1. Certification of Backflow Devices.
 - 2. Hydrostatic Testing.
 - 3. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.

PART 2 - PRODUCTS

All products shall conform to the Colorado Springs Utilities Water Line Extension and Service Standards.

- A. Fire hydrants shall conform to the list in Colorado Springs Utilities Water Line Extension and Service Standards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Trenching, pipe and fitting installation, testing, excavation, backfill and compaction shall conform to the requirements of the referenced standards and drawings. Compaction shall comply with Section 02300.

3.2 REGRADING:

- A. Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

3.3 PIPE LAYING, GENERAL:

WATER UTILITIES

SECTION 33 10 00-2

Deerfield Hills Community Center

LKA Project No. 15-003

Addition/Renovation

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Resident Engineer.
- B. All pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.
- C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.
- D. Contractor shall exercise extreme care when installing piping to shore up and protect from damage all existing underground water line and power lines, and all existing structures.
- E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.
- F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.
- G. Hold pipe securely in place while joint is being made.
- H. Do not walk on pipes in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.
- J. Tees, plugs, caps, bends and hydrants on pipe installed underground shall be anchored per Colorado Springs Utilities Water Line Extension and Service Standards.
- K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.
- L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.
- M. Warning tape shall be continuously placed above buried water pipes.
- N. Cathodic protection shall be provided at all metal fittings, fire hydrants, and for all metal underground pipes, per Colorado Springs Utilities Water Line Extension and Service Standards.

**Deerfield Hills Community Center
Addition/Renovation**

LKA Project No. 15-003

END OF SECTION

Not for Construction

Deerfield Hills Community Center
Addition/Renovation

LKA Project No. 15-003

SECTION 33 30 00 UTILITIES
DIVISION 33 – PAGE 1 SANITARY SEWERAGE UTILITIES

PART 1 – GENERAL

This Section specifies requirements for supplying and installing pressure water main pipe and appurtenances.

1.1 RELATED WORK

- A. Cast-In-Place Concrete Section 03 30 20
- B. Trench Excavation and Backfilling Section 31 23 16
- C. Boring or Jacking Conduits Section 33 71 15
- D. Construction Specification Drawings

1.2 SCHEDULING OF WORK

- A. Maintenance
- B. Notify Local Sewer Department of any planned or accidental interruption of service and for notification to obtain inspections.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Pipe, joints, fittings, manholes, cleanouts and all other items shall conform to the City of Pueblo Public Standards.

PART 3 – EXECUTION

3.1 GENERAL

A. Install and test per the Colorado Springs Utilities Water Line Extension and Service Standards.

PART 4 – TELEVISION INSPECTIONS

4.1 GENERAL

- A. Provide owner a DVD copy of a televised inspection of the sewer lines to ensure they are free of debris at the time of owner occupancy.

END OF SECTION

SECTION 33 44 16 PREFABRICATED TRENCH DRAIN SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. System to Include:
1. Prefabricated Trench Drain Modules
 2. Grate
 3. Outlet and Fittings
 4. Accessories
- B. Related Sections:
1. Earthwork: Section 31 20 00
 2. Cast-in-Place Concrete: Section 03 30 00

1.02 SUBMITTALS

Submit product data for manufactured items provided under this Section in accordance with Sections 01 33 00 and 01 33 23.

1.03 DELIVERY, STORAGE AND HANDLING

Stockpile and store to avoid damage to materials.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Prefabricated Modules: ACO "KlassicDrain" K100S Trench Drain System or approved substitute. Interlocking polymer concrete modular trench drain system with cast in outlet, galvanized steel edge rail channel, 4" round end outlet and all required accessories for a complete installation.
- B. Grating: Class A, slip resistant, UV stable polypropylene, ADA compliant, gray. ACO Type 495Q or approved substitute.

PART 3 - EXECUTION

3.01 GENERAL

Keep trenches dry during installation of drainage system.

3.02 TRENCH DRAIN SYSTEM

- A. Drains: Set in concrete as detailed on the drawings, establish uniform slope as indicated. Complete installation in accordance with manufacturer's recommendations and as detailed.
- B. Finished Grade: Coordinate final grade with concrete flatwork to assure positive drainage.

END OF SECTION

Not for Construction

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