

CONTRACT SPECIFICATIONS

Norwood Community Center

Anniston Housing Authority
Anniston, Alabama

TDA 445

TDA Architects, LLC

The logo for TDA Architects, LLC features the letters 'TDA' in a large, outlined, serif font. The text 'TDA Architects, LLC' is written in a smaller, solid, sans-serif font across the middle of the 'TDA' letters.

INDEX TO SPECIFICATIONS

Norwood Community Center Anniston Housing Authority

Anniston, Alabama

PROJECT DIRECTORY

ADDENDA (when issued)

BIDDING AND CONTRACT REQUIREMENTS

Advertisement for Bids

Instructions to Bidders for Contracts Public and Indian Housing Programs - HUD 5369 (10/2002)

Representations, Certifications, and Other Statements of Bidders - HUD 5369-A (11/1992)

General Conditions of the Contract for Construction - HUD 5370 (11/2006)

Supplemental General Conditions - HUD 4238-N

Bid Form

Form of Bid Bond (7460-8 Rev-1)

Previous Participation Certification - HUD 2530 (05/2001)

Non-Collusive Affidavit

Form of Performance Bond (7460-8 Rev-1)

Form of Payment Bond (7460-8 Rev-1)

Form of Contract - HUD 4238-F

Wage Rates

Section 3 Clause

Form of Advertisement of Completion

HUD CONSTRUCTION FORMS: (not included)

The following HUD construction forms shall be used by the Contractor during construction. A copy of these forms may be obtained from the Architect's office.

Form HUD-5282	Certificate from Contractor - Appointing Officer or Employee to Supervise Payment of Employees
Form HUD-5371	Request for Acceptance of Subcontractor
Form HUD-5372	Construction Progress Schedule
Form HUD-5378	Construction Report
Form HUD-51000a	Schedule of Amounts for Contract Payments
Form HUD-51001	Periodic Estimate for Partial Payment
Form HUD 51002	Schedule of Change Orders
Form HUD-51003	Schedule of Material Stored
Form HUD-51004	Summary of Materials Stored

TECHNICAL SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

00750 - Supplemental General Conditions
01010 - Summary
01045 - Cutting & Patching
01140 - Work Restrictions
01310 - Project Management and Coordination
01320 - Construction Progress Documentation
01330 - Submittal Procedures
01400 - Quality Requirements
01600 - Product Requirements
01700 - Execution Requirements
01710 - Project Closeout
01740 - Final Cleaning

DIVISION 2 - SITEWORK

02280 - Soil Treatment
02300 - Earthwork
02361 - Termite Control

DIVISION 3 - CONCRETE

03300 - Cast in Place Concrete
03310 - Concrete

DIVISION 4 - MASONRY (not applicable)

DIVISION 5 - METAL

05500 - Metal Fabrications

DIVISION 6 - WOOD & PLASTICS

06100 - Rough Carpentry
06113 - Roof Sheathing
06200 - Finish Carpentry
06400 - Architectural Woodwork

DIVISION 7 - THERMAL & MOISTURE PROTECTION

07115 - Sheet Waterproofing
07200 - Insulation
07270 - Firestopping
07311 - Asphalt Shingles
07462 - Siding and Trim
07600 - Flashing & Sheet Metal
07900 - Joint Sealants (Sealants and Caulking)

DIVISION 8 - DOORS, WINDOWS, & GLASS

08110 - Steel Doors & Frames
08210 - Wood Doors
08550 - Aluminum Clad Double Hung Windows
08700 - Finish Hardware

DIVISION 9 - FINISHES

09250 - Gypsum Drywall
09310 - Ceramic Tile
09651 - Resilient Tile Flooring LVT / LVP
09900 - Painting

DIVISION 10 - SPECIALTIES

10200 - Louvers & Vents
10440 - Specialty Signs
10522 - Fire Extinguishers, Cabinets & Accessories
10800 - Toilet Accessories

DIVISION 11 - EQUIPMENT - (not applicable)

DIVISION 12 - FURNISHINGS

12390 - Cabinets

DIVISION 13 - SPECIAL CONSTRUCTION - (not applicable)

DIVISION 14 - CONVEYING SYSTEMS - (not applicable)

DIVISION 15 - MECHANICAL

15010 – Basic Mechanical Requirements

15050 – Basic Mechanical Materials and Methods

15100 – Valves

15145 – Hangers and Supports

15150 – Sanitary Waste and Vent Piping

15170 – Motors

15183 – Refrigerant Piping

15250 – Mechanical Insulation

15411 – Water Distribution Piping

15430 – Plumbing Specialties

15440 – Plumbing Fixtures

15820 – Duct Accessories

15891 – Metal Ductwork

15932 – Air Outlets and Inlets

15990 – Testing, Adjusting, and Balancing

DIVISION 16 - ELECTRICAL

16050 – Basic Electrical Materials and Methods

16060 – Grounding and Bonding

16120 – Conductors and Cables

16130 – Raceways and Boxes

16140 – Wiring Devices

16442 – Panelboards

16475 – Fuses

16476 – Disconnect Switches

16511 – Interior Lighting

16521 – Exterior Lighting

PROJECT DIRECTORY

OWNER:

Anniston Housing Authority
Gregg Fortner, Executive Director
Doug Brooks, Contract Manager
500 Glen Addie Avenue
Anniston, Alabama 36202
(256) 236-1575 telephone
(256) 236-3981 facsimile

ARCHITECT:

TDA Architects, LLC
Steve Taylor
125 West Columbus Street
Dadeville, Alabama 36853
(205) 823-2969 telephone
steve@tdaarchitectsllc.com

ADVERTISEMENT FOR BIDS

The Anniston Housing Authority will receive bids for: **Norwood Community Center, Anniston Housing Authority, Anniston, Alabama**, until **2:00 p.m.** local time on **XXXXXXXXXX, 2023**, at the Housing Authority central office located at 500 Glen Addie Avenue, Anniston, Alabama 36202 at which time and place all will be opened and read aloud.

Scope of work will include (but is not limited to): Construction of a new Community Building and limited site improvements.

Contract documents, including drawings and technical specifications, may be obtained by contacting the following:

Owner: The Anniston Housing Authority
Attention: Mr. Gregg Fortner, Executive Director
Attention: Mr. Doug Brooks, Construction Manager
500 Glen Addie Avenue
Anniston, AL 36202
(256) 236-1575 telephone / (256) 236-3981 facsimile

Architect: TDA Architects, LLC
Attn: Steven Taylor, Architect
125 West Columbus Street
Dadeville, AL 36853
205-823-2969 / 205542-5315 ph.
steve@tdaarchitectsllc.com

Interested Bidders are required to review the complete version of the Contract Documents, posted on the Housing Authority's website at www.annistonhousing.org. Anyone interested in bidding the Project must contact the Architect at the above email address.

Gregg Fortner, Executive Director
The Anniston Housing Authority

Advertise on the following dates: XXXX, XXXX, XXXX, and XXXX, 2023.

**U.S. Department of Housing and
Urban Development**
Office of Public and Indian Housing

**Instructions to Bidders for Contracts
Public and Indian Housing Programs**

Instructions to Bidders for Contracts

Public and Indian Housing Programs

Table of Contents

Clause	Page
1. Bid Preparation and Submission	1
2. Explanations and Interpretations to Prospective Bidders	1
3. Amendments to Invitations for Bids	1
4. Responsibility of Prospective Contractor	1
5. Late Submissions, Modifications, and Withdrawal of Bids	1
6. Bid Opening	2
7. Service of Protest	2
8. Contract Award	2
9. Bid Guarantee	3
10. Assurance of Completion	3
11. Preconstruction Conference	3
12. Indian Preference Requirements	3

1. Bid Preparation and Submission

(a) Bidders are expected to examine the specifications, drawings, all instructions, and, if applicable, the construction site (see also the contract clause entitled **Site Investigation and Conditions Affecting the Work** of the *General Conditions of the Contract for Construction*). Failure to do so will be at the bidders' risk.

(b) All bids must be submitted on the forms provided by the Public Housing Agency/Indian Housing Authority (PHA/IHA). Bidders shall furnish all the information required by the solicitation. Bids must be signed and the bidder's name typed or printed on the bid sheet and each continuation sheet which requires the entry of information by the bidder. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent shall be accompanied by evidence of that agent's authority. (Bidders should retain a copy of their bid for their records.)

(c) Bidders must submit as part of their bid a completed form HUD-5369-A, "Representations, Certifications, and Other Statements of Bidders."

(d) All bid documents shall be sealed in an envelope which shall be clearly marked with the words "Bid Documents," the Invitation for Bids (IFB) number, any project or other identifying number, the bidder's name, and the date and time for receipt of bids.

(e) If this solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "No Bid" in the space provided for any item on which no price is submitted.

(f) Unless expressly authorized elsewhere in this solicitation, alternate bids will not be considered.

(g) Unless expressly authorized elsewhere in this solicitation, bids submitted by telegraph or facsimile (fax) machines will not be considered.

(h) If the proposed contract is for a Mutual Help project (as described in 24 CFR Part 905, Subpart E) that involves Mutual Help contributions of work, material, or equipment, supplemental information regarding the bid advertisement is provided as an attachment to this solicitation.

2. Explanations and Interpretations to Prospective Bidders

(a) Any prospective bidder desiring an explanation or interpretation of the solicitation, specifications, drawings, etc., must request it at least 7 days before the scheduled time for bid opening. Requests may be oral or written. Oral requests must be confirmed in writing. The only oral clarifications that will be provided will be those clearly related to solicitation procedures, i.e., not substantive technical information. No other oral explanation or interpretation will be provided. Any information given a prospective bidder concerning this solicitation will be furnished promptly to all other prospective bidders as a written amendment to the solicitation, if that information is necessary in submitting bids, or if the lack of it would be prejudicial to other prospective bidders.

(b) Any information obtained by, or provided to, a bidder other than by formal amendment to the solicitation shall not constitute a change to the solicitation.

3. Amendments to Invitations for Bids

(a) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged.

(b) Bidders shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by identifying the amendment number and date on the bid form, or (3) by letter, telegram, or facsimile, if those methods are authorized in the solicitation. The PHA/IHA must receive acknowledgement by the time and at the place specified for receipt of bids. Bids which fail to acknowledge the bidder's receipt of any amendment will result in the rejection of the bid if the amendment(s) contained information which substantively changed the PHA's/IHA's requirements.

(c) Amendments will be on file in the offices of the PHA/IHA and the Architect at least 7 days before bid opening.

4. Responsibility of Prospective Contractor

(a) The PHA/IHA will award contracts only to responsible prospective contractors who have the ability to perform successfully under the terms and conditions of the proposed contract. In determining the responsibility of a bidder, the PHA/IHA will consider such matters as the bidder's:

- (1) Integrity;
- (2) Compliance with public policy;
- (3) Record of past performance; and
- (4) Financial and technical resources (including construction and technical equipment).

(b) Before a bid is considered for award, the bidder may be requested by the PHA/IHA to submit a statement or other documentation regarding any of the items in paragraph (a) above. Failure by the bidder to provide such additional information shall render the bidder nonresponsible and ineligible for award.

5. Late Submissions, Modifications, and Withdrawal of Bids

(a) Any bid received at the place designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it:

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of offers (e.g., an offer submitted in response to a solicitation requiring receipt of offers by the 20th of the month must have been mailed by the 15th);

(2) Was sent by mail, or if authorized by the solicitation, was sent by telegram or via facsimile, and it is determined by the PHA/IHA that the late receipt was due solely to mishandling by the PHA/IHA after receipt at the PHA/IHA; or

(3) Was sent by U.S. Postal Service Express Mail Next Day Service - Post Office to Addressee, not later than 5:00 p.m. at the place of mailing two working days prior to the date specified for receipt of proposals. The term "working days" excludes weekends and observed holidays.

(b) Any modification or withdrawal of a bid is subject to the same conditions as in paragraph (a) of this provision.

(c) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark both on the envelope or wrapper and on the original receipt from the U.S. or Canadian Postal Service. Both postmarks must show a legible date or the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerk to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

(d) The only acceptable evidence to establish the time of receipt at the PHA/IHA is the time/date stamp of PHA/IHA on the proposal wrapper or other documentary evidence of receipt maintained by the PHA/IHA.

(e) The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent by Express Mail Next Day Service-Post Office to Addressee is the date entered by the post office receiving clerk on the "Express Mail Next Day Service-Post Office to Addressee" label and the postmark on both the envelope or wrapper and on the original receipt from the U.S. Postal Service. "Postmark" has the same meaning as defined in paragraph (c) of this provision, excluding postmarks of the Canadian Postal Service. Therefore, bidders should request the postal clerk to place a legible hand cancellation bull's eye postmark on both the receipt and Failure by a bidder to acknowledge receipt of the envelope or wrapper.

(f) Notwithstanding paragraph (a) of this provision, a late modification of an otherwise successful bid that makes its terms more favorable to the PHA/IHA will be considered at any time it is received and may be accepted.

(g) Bids may be withdrawn by written notice, or if authorized by this solicitation, by telegram (including mailgram) or facsimile machine transmission received at any time before the exact time set for opening of bids; provided that written confirmation of telegraphic or facsimile withdrawals over the signature of the bidder is mailed and postmarked prior to the specified bid opening time. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for opening of bids, the identity of the person requesting withdrawal is established and the person signs a receipt for the bid.

6. Bid Opening

All bids received by the date and time of receipt specified in the solicitation will be publicly opened and read. The time and place of opening will be as specified in the solicitation. Bidders and other interested persons may be present.

7. Service of Protest

(a) Definitions. As used in this provision:

"Interested party" means an actual or prospective bidder whose direct economic interest would be affected by the award of the contract.

"Protest" means a written objection by an interested party to this solicitation or to a proposed or actual award of a contract pursuant to this solicitation.

(b) Protests shall be served on the Contracting Officer by obtaining written and dated acknowledgement from —

[Contracting Officer designate the official or location where a protest may be served on the Contracting Officer]

(c) All protests shall be resolved in accordance with the PHA's/IHA's protest policy and procedures, copies of which are maintained at the PHA/IHA.

8. Contract Award

(a) The PHA/IHA will evaluate bids in response to this solicitation without discussions and will award a contract to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the PHA/IHA considering only price and any price-related factors specified in the solicitation.

(b) If the apparent low bid received in response to this solicitation exceeds the PHA's/IHA's available funding for the proposed contract work, the PHA/IHA may either accept separately priced items (see 8(e) below) or use the following procedure to determine contract award. The PHA/IHA shall apply in turn to each bid (proceeding in order from the apparent low bid to the high bid) each of the separately priced bid deductible items, if any, in their priority order set forth in this solicitation. If upon the application of the first deductible item to all initial bids, a new low bid is within the PHA's/IHA's available funding, then award shall be made to that bidder. If no bid is within the available funding amount, then the PHA/IHA shall apply the second deductible item. The PHA/IHA shall continue this process until an evaluated low bid, if any, is within the PHA's/IHA's available funding. If upon the application of all deductibles, no bid is within the PHA's/IHA's available funding, or if the solicitation does not request separately priced deductibles, the PHA/IHA shall follow its written policy and procedures in making any award under this solicitation.

(c) In the case of tie low bids, award shall be made in accordance with the PHA's/IHA's written policy and procedures.

(d) The PHA/IHA may reject any and all bids, except other than the lowest bid (e.g., the apparent low bid is unreasonably low), and waive informalities or minor irregularities in bids received, in accordance with the PHA's/IHA's written policy and procedures.

(e) Unless precluded elsewhere in the solicitation, the PHA/IHA may accept any item or combination of items bid.

(f) The PHA/IHA may reject any bid as nonresponsive if it is materially unbalanced as to the prices for the various items of work to be performed. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated for other work.

(g) A written award shall be furnished to the successful bidder within the period for acceptance specified in the bid and shall result in a binding contract without further action by either party.

9. Bid Guarantee (applicable to construction and equipment contracts exceeding \$25,000)

All bids must be accompanied by a negotiable bid guarantee which shall not be less than five percent (5%) of the amount of the bid. The bid guarantee may be a certified check, bank draft, U.S. Government Bonds at par value, or a bid bond secured by a surety company acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. In the case where the work under the contract will be performed on an Indian reservation area, the bid guarantee may also be an irrevocable Letter of Credit (see provision 10, Assurance of Completion, below). Certified checks and bank drafts must be made payable to the order of the PHA/IHA. The bid guarantee shall insure the execution of the contract and the furnishing of a method of assurance of completion by the successful bidder as required by the solicitation. Failure to submit a bid guarantee with the bid shall result in the rejection of the bid. Bid guarantees submitted by unsuccessful bidders will be returned as soon as practicable after bid opening.

10. Assurance of Completion

(a) Unless otherwise provided in State law, the successful bidder shall furnish an assurance of completion prior to the execution of any contract under this solicitation. This assurance may be [Contracting Officer check applicable items] —

(1) a performance and payment bond in a penal sum of 100 percent of the contract price; or, as may be required or permitted by State law;

(2) separate performance and payment bonds, each for 50 percent or more of the contract price;

(3) a 20 percent cash escrow;

(4) a 25 percent irrevocable letter of credit; or,

(5) an irrevocable letter of credit for 10 percent of the total contract price with a monitoring and disbursements agreement with the IHA (applicable only to contracts awarded by an IHA under the Indian Housing Program).

(b) Bonds must be obtained from guarantee or surety companies acceptable to the U.S. Government and authorized to do business in the state where the work is to be performed. Individual sureties will not be considered. U.S. Treasury Circular Number 570, published annually in the Federal Register, lists companies approved to act as sureties on bonds securing Government contracts, the maximum underwriting limits on each contract bonded, and the States in which the company is licensed to do business. Use of companies listed in this circular is mandatory. Copies of the circular may be downloaded on the U.S. Department of Treasury website <http://www.fms.treas.gov/c570/index.html>, or ordered for a minimum fee by contacting the Government Printing Office at (202) 512-2168.

(c) Each bond shall clearly state the rate of premium and the total amount of premium charged. The current power of attorney for the person who signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond. The effective date of the bond shall be on or after the execution date of the contract.

(d) Failure by the successful bidder to obtain the required assurance of completion within the time specified, or within such extended period as the PHA/IHA may grant based upon reasons determined adequate by the PHA/IHA, shall render the bidder ineligible for award. The PHA/IHA may then either award the contract to the next lowest responsible bidder or solicit new bids. The PHA/IHA may retain the ineligible bidder's bid guarantee.

11. Preconstruction Conference (applicable to construction contracts)

After award of a contract under this solicitation and prior to the start of work, the successful bidder will be required to attend a preconstruction conference with representatives of the PHA/IHA and its architect/engineer, and other interested parties convened by the PHA/IHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract (e.g., Equal Employment Opportunity, Labor Standards). The PHA/IHA will provide the successful bidder with the date, time, and place of the conference.

12. Indian Preference Requirements (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

(a) HUD has determined that the contract awarded under this solicitation is subject to the requirements of section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e(b)). Section 7(b) requires that any contract or subcontract entered into for the benefit of Indians shall require that, to the greatest extent feasible

(1) Preferences and opportunities for training and employment (other than core crew positions; see paragraph (h) below) in connection with the administration of such contracts or subcontracts be given to qualified "Indians." The Act defines "Indians" to mean persons who are members of an Indian tribe and defines "Indian tribe" to mean any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act, which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians; and,

(2) Preference in the award of contracts or subcontracts in connection with the administration of contracts be given to Indian organizations and to Indian-owned economic enterprises, as defined in section 3 of the Indian Financing Act of 1974 (25 U.S.C. 1452). That Act defines "economic enterprise" to mean any Indian-owned commercial, industrial, or business activity established or organized for the purpose of profit, except that the Indian ownership must constitute not less than 51 percent of the enterprise; "Indian organization" to mean the governing body of any Indian tribe or entity established or recognized by such governing body; "Indian" to mean any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act; and Indian "tribe" to mean any Indian tribe, band, group, pueblo, or community including Native villages and Native groups (including

corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

(b) (1) The successful Contractor under this solicitation shall comply with the requirements of this provision in awarding all subcontracts under the contract and in providing training and employment opportunities.

(2) A finding by the IHA that the contractor, either (i) awarded a subcontract without using the procedure required by the IHA, (ii) falsely represented that subcontracts would be awarded to Indian enterprises or organizations; or, (iii) failed to comply with the contractor's employment and training preference bid statement shall be grounds for termination of the contract or for the assessment of penalties or other remedies.

(c) If specified elsewhere in this solicitation, the IHA may restrict the solicitation to qualified Indian-owned enterprises and Indian organizations. If two or more (or a greater number as specified elsewhere in the solicitation) qualified Indian-owned enterprises or organizations submit responsive bids, award shall be made to the qualified enterprise or organization with the lowest responsive bid. If fewer than the minimum required number of qualified Indian-owned enterprises or organizations submit responsive bids, the IHA shall reject all bids and readvertise the solicitation in accordance with paragraph (d) below.

(d) If the IHA prefers not to restrict the solicitation as described in paragraph (c) above, or if after having restricted a solicitation an insufficient number of qualified Indian enterprises or organizations submit bids, the IHA may advertise for bids from non-Indian as well as Indian-owned enterprises and Indian organizations. Award shall be made to the qualified Indian enterprise or organization with the lowest responsive bid if that bid is -

(1) Within the maximum HUD-approved budget amount established for the specific project or activity for which bids are being solicited; and

(2) No more than the percentage specified in 24 CFR 905.175(c) higher than the total bid price of the lowest responsive bid from any qualified bidder. If no responsive bid by a qualified Indian-owned economic enterprise or organization is within the stated range of the total bid price of the lowest responsive bid from any qualified enterprise, award shall be made to the bidder with the lowest bid.

(e) Bidders seeking to qualify for preference in contracting or subcontracting shall submit proof of Indian ownership with their bids. Proof of Indian ownership shall include but not be limited to:

(1) Certification by a tribe or other evidence that the bidder is an Indian. The IHA shall accept the certification of a tribe that an individual is a member.

(2) Evidence such as stock ownership, structure, management, control, financing and salary or profit sharing arrangements of the enterprise.

(f) (1) All bidders must submit with their bids a statement describing how they will provide Indian preference in the award of subcontracts. The specific requirements of that statement and the factors to be used by the IHA in determining the statement's adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement shall be rejected as nonresponsive. The IHA may require that comparable statements be provided by subcontractors to the successful Contractor, and may require the Contractor to reject any bid or proposal by a subcontractor that fails to include the statement.

(2) Bidders and prospective subcontractors shall submit a certification (supported by credible evidence) to the IHA in any instance where the bidder or subcontractor believes it is infeasible to provide Indian preference in subcontracting. The acceptance or rejection by the IHA of the certification shall be final. Rejection shall disqualify the bid from further consideration.

(g) All bidders must submit with their bids a statement detailing their employment and training opportunities and their plans to provide preference to Indians in implementing the contract; and the number or percentage of Indians anticipated to be employed and trained. Comparable statements from all proposed subcontractors must be submitted. The criteria to be used by the IHA in determining the statement(s)'s adequacy are included as an attachment to this solicitation. Any bid that fails to include the required statement(s), or that includes a statement that does not meet minimum standards required by the IHA shall be rejected as nonresponsive.

(h) Core crew employees. A core crew employee is an individual who is a bona fide employee of the contractor at the time the bid is submitted; or an individual who was not employed by the bidder at the time the bid was submitted, but who is regularly employed by the bidder in a supervisory or other key skilled position when work is available. Bidders shall submit with their bids a list of all core crew employees.

(i) Preference in contracting, subcontracting, employment, and training shall apply not only on-site, on the reservation, or within the IHA's jurisdiction, but also to contracts with firms that operate outside these areas (e.g., employment in modular or manufactured housing construction facilities).

(j) Bidders should contact the IHA to determine if any additional local preference requirements are applicable to this solicitation.

(k) The IHA [] does [] does not [Contracting Officer check applicable box] maintain lists of Indian-owned economic enterprises and Indian organizations by specialty (e.g., plumbing, electrical, foundations), which are available to bidders to assist them in meeting their responsibility to provide preference in connection with the administration of contracts and subcontracts.

**U.S. Department of Housing
and Urban Development**
Office of Public and Indian Housing

**Representations, Certifications,
and Other Statements of Bidders**
Public and Indian Housing Programs

Representations, Certifications, and Other Statements of Bidders

Public and Indian Housing Programs

Table of Contents

Clause	Page
1. Certificate of Independent Price Determination	1
2. Contingent Fee Representation and Agreement	1
3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions	1
4. Organizational Conflicts of Interest Certification	2
5. Bidder's Certification of Eligibility	2
6. Minimum Bid Acceptance Period	2
7. Small, Minority, Women-Owned Business Concern Representation	2
8. Indian-Owned Economic Enterprise and Indian Organization Representation	2
9. Certification of Eligibility Under the Davis-Bacon Act	3
10. Certification of Nonsegregated Facilities	3
11. Clean Air and Water Certification	3
12. Previous Participation Certificate	3
13. Bidder's Signature	3

1. Certificate of Independent Price Determination

(a) The bidder certifies that--

(1) The prices in this bid have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other bidder or competitor relating to (i) those prices, (ii) the intention to submit a bid, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this bid have not been and will not be knowingly disclosed by the bidder, directly or indirectly, to any other bidder or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a competitive proposal solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the bidder to induce any other concern to submit or not to submit a bid for the purpose of restricting competition.

(b) Each signature on the bid is considered to be a certification by the signatory that the signatory--

(1) Is the person in the bidder's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

_____ [insert full name of person(s) in the bidder's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the bidder's organization];

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the bidder deletes or modifies subparagraph (a)2 above, the bidder must furnish with its bid a signed statement setting forth in detail the circumstances of the disclosure.

[] [Contracting Officer check if following paragraph is applicable]

(d) Non-collusive affidavit. (applicable to contracts for construction and equipment exceeding \$50,000)

(1) Each bidder shall execute, in the form provided by the PHA/IHA, an affidavit to the effect that he/she has not colluded with any other person, firm or corporation in regard to any bid submitted in response to this solicitation. If the successful bidder did not submit the affidavit with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the affidavit by that date may render the bid nonresponsive. No contract award will be made without a properly executed affidavit.

(2) A fully executed "Non-collusive Affidavit" [] is, [] is not included with the bid.

2. Contingent Fee Representation and Agreement

(a) Definitions. As used in this provision:

"Bona fide employee" means a person, employed by a bidder and subject to the bidder's supervision and control as to time, place, and manner of performance, who neither exerts, nor proposes to exert improper influence to solicit or obtain contracts nor holds out as being able to obtain any contract(s) through improper influence.

"Improper influence" means any influence that induces or tends to induce a PHA/IHA employee or officer to give consideration or to act regarding a PHA/IHA contract on any basis other than the merits of the matter.

(b) The bidder represents and certifies as part of its bid that, except for full-time bona fide employees working solely for the bidder, the bidder:

(1) [] has, [] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [] has, [] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

(c) If the answer to either (a)(1) or (a)(2) above is affirmative, the bidder shall make an immediate and full written disclosure to the PHA/IHA Contracting Officer.

(d) Any misrepresentation by the bidder shall give the PHA/IHA the right to (1) terminate the contract; (2) at its discretion, deduct from contract payments the amount of any commission, percentage, brokerage, or other contingent fee; or (3) take other remedy pursuant to the contract.

3. Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions (applicable to contracts exceeding \$100,000)

(a) The definitions and prohibitions contained in Section 1352 of title 31, United States Code, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The bidder, by signing its bid, hereby certifies to the best of his or her knowledge and belief as of December 23, 1989 that:

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of a contract resulting from this solicitation;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the bidder shall complete and submit, with its bid, OMB standard form LLL, "Disclosure of Lobbying Activities;" and

(3) He or she will include the language of this certification in all subcontracts at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

(d) Indian tribes (except those chartered by States) and Indian organizations as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) are exempt from the requirements of this provision.

4. Organizational Conflicts of Interest Certification

The bidder certifies that to the best of its knowledge and belief and except as otherwise disclosed, he or she does not have any organizational conflict of interest which is defined as a situation in which the nature of work to be performed under this proposed contract and the bidder's organizational, financial, contractual, or other interests may, without some restriction on future activities:

- (a) Result in an unfair competitive advantage to the bidder; or,
- (b) Impair the bidder's objectivity in performing the contract work.

[] In the absence of any actual or apparent conflict, I hereby certify that to the best of my knowledge and belief, no actual or apparent conflict of interest exists with regard to my possible performance of this procurement.

5. Bidder's Certification of Eligibility

(a) By the submission of this bid, the bidder certifies that to the best of its knowledge and belief, neither it, nor any person or firm which has an interest in the bidder's firm, nor any of the bidder's subcontractors, is ineligible to:

(1) Be awarded contracts by any agency of the United States Government, HUD, or the State in which this contract is to be performed; or,

(2) Participate in HUD programs pursuant to 24 CFR Part 24.

(b) The certification in paragraph (a) above is a material representation of fact upon which reliance was placed when making award. If it is later determined that the bidder knowingly rendered an erroneous certification, the contract may be terminated for default, and the bidder may be debarred or suspended from participation in HUD programs and other Federal contract programs.

6. Minimum Bid Acceptance Period

(a) "Acceptance period," as used in this provision, means the number of calendar days available to the PHA/IHA for awarding a contract from the date specified in this solicitation for receipt of bids.

(b) This provision supersedes any language pertaining to the acceptance period that may appear elsewhere in this solicitation.

(c) The PHA/IHA requires a minimum acceptance period of [Contracting Officer insert time period] calendar days.

(d) In the space provided immediately below, bidders may specify a longer acceptance period than the PHA's/IHA's minimum requirement. The bidder allows the following acceptance period: calendar days.

(e) A bid allowing less than the PHA's/IHA's minimum acceptance period will be rejected.

(f) The bidder agrees to execute all that it has undertaken to do, in compliance with its bid, if that bid is accepted in writing within (1) the acceptance period stated in paragraph (c) above or (2) any longer acceptance period stated in paragraph (d) above.

7. Small, Minority, Women-Owned Business Concern Representation

The bidder represents and certifies as part of its bid/ offer that it --

(a) [] is, [] is not a small business concern. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding, and qualified as a small business under the criteria and size standards in 13 CFR 121.

(b) [] is, [] is not a women-owned business enterprise. "Women-owned business enterprise," as used in this provision, means a business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

(c) [] is, [] is not a minority business enterprise. "Minority business enterprise," as used in this provision, means a business which is at least 51 percent owned or controlled by one or more minority group members or, in the case of a publicly owned business, at least 51 percent of its voting stock is owned by one or more minority group members, and whose management and daily operations are controlled by one or more such individuals. For the purpose of this definition, minority group members are:

(Check the block applicable to you)

- [] Black Americans
- [] Asian Pacific Americans
- [] Hispanic Americans
- [] Asian Indian Americans
- [] Native Americans
- [] Hasidic Jewish Americans

8. Indian-Owned Economic Enterprise and Indian Organization Representation (applicable only if this solicitation is for a contract to be performed on a project for an Indian Housing Authority)

The bidder represents and certifies that it:

(a) [] is, [] is not an Indian-owned economic enterprise. "Economic enterprise," as used in this provision, means any commercial, industrial, or business activity established or organized for the purpose of profit, which is at least 51 percent Indian owned. "Indian," as used in this provision, means any person who is a member of any tribe, band, group, pueblo, or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs and any "Native" as defined in the Alaska Native Claims Settlement Act.

(b) [] is, [] is not an Indian organization. "Indian organization," as used in this provision, means the governing body of any Indian tribe or entity established or recognized by such governing body. Indian "tribe" means any Indian tribe, band, group, pueblo, or

community including Native villages and Native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs.

9. Certification of Eligibility Under the Davis-Bacon Act (applicable to construction contracts exceeding \$2,000)

(a) By the submission of this bid, the bidder certifies that neither it nor any person or firm who has an interest in the bidder's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of the contract resulting from this solicitation shall be subcontracted to any person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

10. Certification of Nonsegregated Facilities (applicable to contracts exceeding \$10,000)

(a) The bidder's attention is called to the clause entitled **Equal Employment Opportunity** of the General Conditions of the Contract for Construction.

(b) "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

(c) By the submission of this bid, the bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The bidder agrees that a breach of this certification is a violation of the Equal Employment Opportunity clause in the contract.

(d) The bidder further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) prior to entering into subcontracts which exceed \$10,000 and are not exempt from the requirements of the Equal Employment Opportunity clause, it will:

- (1) Obtain identical certifications from the proposed subcontractors;
- (2) Retain the certifications in its files; and
- (3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

Notice to Prospective Subcontractors of Requirement for Certifications of Nonsegregated Facilities

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Employment Opportunity clause of the prime contract. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

Note: The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

11. Clean Air and Water Certification (applicable to contracts exceeding \$100,000)

The bidder certifies that:

(a) Any facility to be used in the performance of this contract [] is, [] is not listed on the Environmental Protection Agency List of Violating Facilities:

(b) The bidder will immediately notify the PHA/IHA Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the bidder proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and,

(c) The bidder will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

12. Previous Participation Certificate (applicable to construction and equipment contracts exceeding \$50,000)

(a) The bidder shall complete and submit with his/her bid the Form HUD-2530, "Previous Participation Certificate." If the successful bidder does not submit the certificate with his/her bid, he/she must submit it within three (3) working days of bid opening. Failure to submit the certificate by that date may render the bid nonresponsive. No contract award will be made without a properly executed certificate.

(b) A fully executed "Previous Participation Certificate" [] is, [] is not included with the bid.

13. Bidder's Signature

The bidder hereby certifies that the information contained in these certifications and representations is accurate, complete, and current.

(Signature and Date)

(Typed or Printed Name)

(Title)

(Company Name)

(Company Address)

General Conditions for Construction Contracts - Public Housing Programs

U.S. Department of Housing and Urban Development
Office of Public and Indian Housing
OMB Approval No. 2577-0157 (exp. 1/31/2017)

Applicability. This form is applicable to any construction/development contract greater than \$100,000.

This form includes those clauses required by OMB's common rule on grantee procurement, implemented at HUD in 24 CFR 85.36, and those requirements set forth in Section 3 of the Housing and Urban Development Act of 1968 and its amendment by the Housing and Community Development Act of 1992, implemented by HUD at 24 CFR Part 135. The form is required for construction contracts awarded by Public Housing Agencies (PHAs).

The form is used by Housing Authorities in solicitations to provide necessary contract clauses. If the form were not used, HAs would be unable to enforce their contracts.

Public reporting burden for this collection of information is estimated to average 1.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Responses to the collection of information are required to obtain a benefit or to retain a benefit.

The information requested does not lend itself to confidentiality.

HUD may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB number.

Clause		Page	Clause		Page
1.	Definitions	2	Administrative Requirements		
2.	Contractor's Responsibility for Work	2	25.	Contract Period	9
3.	Architect's Duties, Responsibilities and Authority	2	26.	Order of Precedence	9
4.	Other Contracts	3	27.	Payments	9
	Construction Requirements		28.	Contract Modifications	10
5.	Preconstruction Conference and Notice to Proceed	3	29.	Changes	10
6.	Construction Progress Schedule	3	30.	Suspension of Work	11
7.	Site Investigation and Conditions Affecting the Work	3	31.	Disputes	11
8.	Differing Site Conditions	4	32.	Default	11
9.	Specifications and Drawings for Construction	4	33.	Liquidated	12
10.	As-Built Drawings	5	34.	Termination of Convenience	12
11.	Material and Workmanship	5	35.	Assignment of Contract	12
12.	Permits and Codes	5	36.	Insurance	12
13.	Health, Safety, and Accident Prevention	6	37.	Subcontracts	13
14.	Temporary Buildings and Transportation Materials	6	38.	Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms	13
15.	Availability and Use of Utility Services	6	39.	Equal Employment Opportunity	13
16.	Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements	6	40.	Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968	14
17.	Temporary Buildings and Transportation Materials	7	41.	Interest of Members of Congress	15
18.	Clean Air and Water	7	42.	Interest of Members, Officers, or Employees and Former Members, Officers, or Employees	15
19.	Energy Efficiency	7	43.	Limitations on Payments Made to Influence	15
20.	Inspection and Acceptance of Construction	7	44.	Royalties and Patents	15
21.	Use and Possession Prior to	8	45.	Examination and Retention of Contractor's Records	15
22.	Warranty of Title	8	46.	Labor Standards-Davis-Bacon and Related Acts	15
23.	Warranty of	8	47.	Non-Federal Prevailing Wage Rates	19
24.	Prohibition Against	9	48.	Procurement of Recovered	19

1. Definitions

- (a) "Architect" means the person or other entity engaged by the PHA to perform architectural, engineering, design, and other services related to the work as provided for in the contract. When a PHA uses an engineer to act in this capacity, the terms "architect" and "engineer" shall be synonymous. The Architect shall serve as a technical representative of the Contracting Officer. The Architect's authority is as set forth elsewhere in this contract.
 - (b) "Contract" means the contract entered into between the PHA and the Contractor. It includes the forms of Bid, the Bid Bond, the Performance and Payment Bond or Bonds or other assurance of completion, the Certifications, Representations, and Other Statements of Bidders (form HUD-5370), these General Conditions of the Contract for Construction (form HUD-5370), the applicable wage rate determinations from the U.S. Department of Labor, any special conditions included elsewhere in the contract, the specifications, and drawings. It includes all formal changes to any of those documents by addendum, change order, or other modification.
 - (c) "Contracting Officer" means the person delegated the authority by the PHA to enter into, administer, and/or terminate this contract and designated as such in writing to the Contractor. The term includes any successor Contracting Officer and any duly authorized representative of the Contracting Officer also designated in writing. The Contracting Officer shall be deemed the authorized agent of the PHA in all dealings with the Contractor.
 - (d) "Contractor" means the person or other entity entering into the contract with the PHA to perform all of the work required under the contract.
 - (e) "Drawings" means the drawings enumerated in the schedule of drawings contained in the Specifications and as described in the contract clause entitled Specifications and Drawings for Construction herein.
 - (f) "HUD" means the United States of America acting through the Department of Housing and Urban Development including the Secretary, or any other person designated to act on its behalf. HUD has agreed, subject to the provisions of an Annual Contributions Contract (ACC), to provide financial assistance to the PHA, which includes assistance in financing the work to be performed under this contract. As defined elsewhere in these General Conditions or the contract documents, the determination of HUD may be required to authorize changes in the work or for release of funds to the PHA for payment to the Contractor. Notwithstanding HUD's role, nothing in this contract shall be construed to create any contractual relationship between the Contractor and HUD.
 - (g) "Project" means the entire project, whether construction or rehabilitation, the work for which is provided for in whole or in part under this contract.
 - (h) "PHA" means the Public Housing Agency organized under applicable state laws which is a party to this contract.
 - (j) "Specifications" means the written description of the technical requirements for construction and includes the criteria and tests for determining whether the requirements are met.
 - (l) "Work" means materials, workmanship, and manufacture and fabrication of components.
- (a) The Contractor shall furnish all necessary labor, materials, tools, equipment, and transportation necessary for performance of the work. The Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by the PHA pursuant to the clause entitled Availability and Use of Utility Services herein.
 - (b) The Contractor shall perform on the site, and with its own organization, work equivalent to at least [] (12 percent unless otherwise indicated) of the total amount of work to be performed under the order. This percentage may be reduced by a supplemental agreement to this order if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the PHA.
 - (c) At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.
 - (d) The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall hold and save the PHA, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.
 - (e) The Contractor shall lay out the work from base lines and bench marks indicated on the drawings and be responsible for all lines, levels, and measurements of all work executed under the contract. The Contractor shall verify the figures before laying out the work and will be held responsible for any error resulting from its failure to do so.
 - (f) The Contractor shall confine all operations (including storage of materials) on PHA premises to areas authorized or approved by the Contracting Officer.
 - (g) The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. After completing the work and before final inspection, the Contractor shall (1) remove from the premises all scaffolding, equipment, tools, and materials (including rejected materials) that are not the property of the PHA and all rubbish caused by its work; (2) leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer; (3) perform all specified tests; and, (4) deliver the installation in complete and operating condition.
 - (h) The Contractor's responsibility will terminate when all work has been completed, the final inspection made, and the work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

3. Architect's Duties, Responsibilities, and Authority

- (a) The Architect for this contract, and any successor, shall be designated in writing by the Contracting Officer.

2. Contractor's Responsibility for Work

- (b) The Architect shall serve as the Contracting Officer's technical representative with respect to architectural, engineering, and design matters related to the work performed under the contract. The Architect may provide direction on contract performance. Such direction shall be within the scope of the contract and may not be of a nature which: (1) institutes additional work outside the scope of the contract; (2) constitutes a change as defined in the Changes clause herein; (3) causes an increase or decrease in the cost of the contract; (4) alters the Construction Progress Schedule; or (5) changes any of the other express terms or conditions of the contract.
- (c) The Architect's duties and responsibilities may include but shall not be limited to:
- (1) Making periodic visits to the work site, and on the basis of his/her on-site inspections, issuing written reports to the PHA which shall include all observed deficiencies. The Architect shall file a copy of the report with the Contractor's designated representative at the site;
 - (2) Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance by the Contracting Officer;
 - (3) Reviewing and making recommendations with respect to - (i) the Contractor's construction progress schedules; (ii) the Contractor's shop and detailed drawings; (iii) the machinery, mechanical and other equipment and materials or other articles proposed for use by the Contractor; and, (iv) the Contractor's price breakdown and progress payment estimates; and,
 - (4) Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract.

4. Other Contracts

The PHA may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with PHA employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by PHA employees

Construction Requirements

5. Pre-construction Conference and Notice to Proceed

- (a) Within ten calendar days of contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with representatives of the PHA, its Architect, and other interested parties convened by the PHA. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the contract. The PHA will provide the Contractor with the date, time, and place of the conference.
- (b) The contractor shall begin work upon receipt of a written Notice to Proceed from the Contracting Officer or designee. The Contractor shall not begin work prior to receiving such notice.

6. Construction Progress Schedule

- (a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring labor, materials, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments or take other remedies under the contract until the Contractor submits the required schedule.
- (b) The Contractor shall enter the actual progress on the chart as required by the Contracting Officer, and immediately deliver three copies of the annotated schedule to the Contracting Officer. If the Contracting Officer determines, upon the basis of inspection conducted pursuant to the clause entitled Inspection and Acceptance of Construction, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the PHA. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.
- (c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the Default clause of this contract.

7. Site Investigation and Conditions Affecting the Work

- (a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to, (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

- reasonably ascertainable from an inspection of the site, including all exploratory work done by the PHA, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the PHA.
- (b) The PHA assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the PHA. Nor does the PHA assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

8. Differing Site Conditions

- (a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.
- (b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. Work shall not proceed at the affected site, except at the Contractor's risk, until the Contracting Officer has provided written instructions to the Contractor. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to the PHA within ten days after receipt of such instructions and, in any event, before proceeding with the work. An equitable adjustment in the contract price, the delivery schedule, or both shall be made under this clause and the contract modified in writing accordingly.
- (c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.
- (d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

9. Specifications and Drawings for Construction

- (a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.
- (b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.
- (c) Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place" that is "furnished and installed".
- (d) "Shop drawings" means drawings, submitted to the PHA by the Contractor, subcontractor, or any lower tier subcontractor, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The PHA may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.
- (e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the PHA's reasons therefore. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.
- (f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Architect approves any such variation and the Contracting Officer concurs, the Contracting Officer shall issue an appropriate modification to the contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.
- (g) It shall be the responsibility of the Contractor to make timely requests of the PHA for such large scale and full size drawings, color schemes, and other additional information, not already in his possession, which shall be

required in the planning and production of the work. Such requests may be submitted as the need arises, but each such request shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

- (h) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the PHA and one set will be returned to the Contractor. As required by the Contracting Officer, the Contractor, upon completing the work under this contract, shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the work is completed and accepted.
- (i) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to the Contracting Officer.

10. As-Built Drawings

- (a) "As-built drawings," as used in this clause, means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or work as actually completed under the contract. "As-built drawings" shall be synonymous with "Record drawings."
- (b) As required by the Contracting Officer, the Contractor shall provide the Contracting Officer accurate information to be used in the preparation of permanent as-built drawings. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.
- (c) This clause shall be included in all subcontracts at any tier. It shall be the responsibility of the Contractor to ensure that all as-built drawings prepared by subcontractors are submitted to the Contracting Officer.

11. Material and Workmanship

- (a) All equipment, material, and articles furnished under this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.
- (b) Approval of equipment and materials.
 - (1) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the

machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

- (2) When required by the specifications or the Contracting Officer, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid. The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.
- (3) Certificates shall be submitted in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
- (4) Approval of a sample shall not constitute a waiver of the PHA right to demand full compliance with contract requirements. Materials, equipment and accessories may be rejected for cause even though samples have been approved.
- (5) Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other contract requirements. The Contracting Officer may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples. Check tests will be made on materials delivered for use only as frequently as the Contracting Officer determines necessary to insure compliance of materials with the specifications. The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.
- (6) After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.
- (c) Requirements concerning lead-based paint. The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. 4821-4846) as implemented by 24 CFR Part 35.

12. Permits and Codes

- (a) The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules and regulations. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the contract, all work installed shall comply with all applicable codes and regulations as amended by any

waivers. Before installing the work, the Contractor shall examine the drawings and the specifications for compliance with applicable codes and regulations bearing on the work and shall immediately report any discrepancy it may discover to the Contracting Officer. Where the requirements of the drawings and specifications fail to comply with the applicable code or regulation, the Contracting Officer shall modify the contract by change order pursuant to the clause entitled Changes herein to conform to the code or regulation.

- (b) The Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of the work. Where the PHA can arrange for the issuance of all or part of these permits, fees and licenses, without cost to the Contractor, the contract amount shall be reduced accordingly.

13. Health, Safety, and Accident Prevention

- (a) In performing this contract, the Contractor shall:
 - (1) Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;
 - (2) Protect the lives, health, and safety of other persons;
 - (3) Prevent damage to property, materials, supplies, and equipment; and,
 - (4) Avoid work interruptions.
- (b) For these purposes, the Contractor shall:
 - (1) Comply with regulations and standards issued by the Secretary of Labor at 29 CFR Part 1926. Failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96), 40 U.S.C. 3701 et seq.; and
 - (2) Include the terms of this clause in every subcontract so that such terms will be binding on each subcontractor.
- (c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 29 CFR Part 1904.
- (d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.
- (e) The Contractor shall be responsible for its subcontractors' compliance with the provisions of this clause. The Contractor shall take such action with respect to any subcontract as the PHA, the Secretary of Housing and Urban Development, or the Secretary of Labor shall direct as a means of enforcing such provisions.

14. Temporary Heating

The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work, and to facilitate the completion of the work. Any permanent heating equipment used shall be turned over to the PHA in the condition and at the time required by the specifications.

15. Availability and Use of Utility Services

- (a) The PHA shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the PHA or, where the utility is produced by the PHA, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.
- (b) The Contractor, at its expense and in a manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the PHA, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

16. Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements

- (a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed under this contract, and which do not unreasonably interfere with the work required under this contract.
- (b) The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during performance of this contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- (c) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.
- (d) The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the project.
- (e) Any equipment temporarily removed as a result of work under this contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this contract.

- (f) New work which connects to existing work shall correspond in all respects with that to which it connects and/or be similar to existing work unless otherwise required by the specifications.
- (g) No structural members shall be altered or in any way weakened without the written authorization of the Contracting Officer, unless such work is clearly specified in the plans or specifications.
- (h) If the removal of the existing work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious. This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different planes or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.
- (i) The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before the commencement of any work.
- (j) The Contractor shall indemnify and save harmless the PHA from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which the PHA may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.
- (k) The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

17. Temporary Buildings and Transportation of Materials

- (a) Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the PHA. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- (b) The Contractor shall, as directed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

18. Clean Air and Water

The contractor shall comply with the Clean Air Act, as amended, 42 USC 7401 et seq., the Federal Water Pollution Control Water Act, as amended, 33 U.S.C. 1251 et seq., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

19. Energy Efficiency

The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub.L. 94-163) for the State in which the work under the contract is performed.

20. Inspection and Acceptance of Construction

- (a) Definitions. As used in this clause -
 - (1) "Acceptance" means the act of an authorized representative of the PHA by which the PHA approves and assumes ownership of the work performed under this contract. Acceptance may be partial or complete.
 - (2) "Inspection" means examining and testing the work performed under the contract (including, when appropriate, raw materials, equipment, components, and intermediate assemblies) to determine whether it conforms to contract requirements.
 - (3) "Testing" means that element of inspection that determines the properties or elements, including functional operation of materials, equipment, or their components, by the application of established scientific principles and procedures.
- (b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. All work is subject to PHA inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.
- (c) PHA inspections and tests are for the sole benefit of the PHA and do not: (1) relieve the Contractor of responsibility for providing adequate quality control measures; (2) relieve the Contractor of responsibility for loss or damage of the material before acceptance; (3) constitute or imply acceptance; or, (4) affect the continuing rights of the PHA after acceptance of the completed work under paragraph (j) below.
- (d) The presence or absence of the PHA inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specifications without the Contracting Officer's written authorization. All instructions and approvals with respect to the work shall be given to the Contractor by the Contracting Officer.
- (e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The PHA may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The PHA shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

- (f) The PHA may conduct routine inspections of the construction site on a daily basis.
- (g) The Contractor shall, without charge, replace or correct work found by the PHA not to conform to contract requirements, unless the PHA decides that it is in its interest to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.
- (h) If the Contractor does not promptly replace or correct rejected work, the PHA may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor, or (2) terminate for default the Contractor's right to proceed.
- (i) If any work requiring inspection is covered up without approval of the PHA, it must, if requested by the Contracting Officer, be uncovered at the expense of the Contractor. If at any time before final acceptance of the entire work, the PHA considers it necessary or advisable, to examine work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the Contracting Officer shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.
- (j) The Contractor shall notify the Contracting Officer, in writing, as to the date when in its opinion all or a designated portion of the work will be substantially completed and ready for inspection. If the Architect determines that the state of preparedness is as represented, the PHA will promptly arrange for the inspection. Unless otherwise specified in the contract, the PHA shall accept, as soon as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines and designates can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the PHA's right under any warranty or guarantee.

21. Use and Possession Prior to Completion

- (a) The PHA shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the PHA intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The PHA's possession or use shall not be deemed an acceptance of any work under the contract.
- (b) While the PHA has such possession or use, the Contractor shall be relieved of the responsibility for (1) the loss of or damage to the work resulting from the PHA's possession or use, notwithstanding the terms of the clause entitled Permits and Codes herein; (2) all maintenance costs on the areas occupied; and, (3) furnishing heat, light, power, and water used in the areas

occupied without proper remuneration therefore. If prior possession or use by the PHA delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

22. Warranty of Title

The Contractor warrants good title to all materials, supplies, and equipment incorporated in the work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

23. Warranty of Construction

- (a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of _____ (one year unless otherwise indicated) from the date of final acceptance of the work. If the PHA takes possession of any part of the work before final acceptance, this warranty shall continue for a period of (one year unless otherwise indicated) from the date that the PHA takes possession.
- (b) The Contractor shall remedy, at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to PHA-owned or controlled real or personal property when the damage is the result of—
 - (1) The Contractor's failure to conform to contract requirements; or
 - (2) Any defects of equipment, material, workmanship or design furnished by the Contractor.
- (c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for (one year unless otherwise indicated) from the date of repair or replacement.
- (d) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect or damage.
- (e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the PHA shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at the Contractor's expense.
- (f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:
 - (1) Obtain all warranties that would be given in normal commercial practice;
 - (2) Require all warranties to be executed in writing, for the benefit of the PHA; and,
 - (3) Enforce all warranties for the benefit of the PHA.
- (g) In the event the Contractor's warranty under paragraph (a) of this clause has expired, the PHA may bring suit at its own expense to enforce a subcontractor's, manufacturer's or supplier's warranty.

- (h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defect of material or design furnished by the PHA nor for the repair of any damage that results from any defect in PHA furnished material or design.
- (i) Notwithstanding any provisions herein to the contrary, the establishment of the time periods in paragraphs (a) and (c) above relate only to the specific obligation of the Contractor to correct the work, and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to its obligation other than specifically to correct the work.
- (j) This warranty shall not limit the PHA's rights under the Inspection and Acceptance of Construction clause of this contract with respect to latent defects, gross mistakes or fraud.

24. Prohibition Against Liens

The Contractor is prohibited from placing a lien on the PHA's property. This prohibition shall apply to all subcontractors at any tier and all materials suppliers.

Administrative Requirements

25. Contract Period

this contract within _____ calendar days of the effective date of the contract, or within the time schedule established in the notice to proceed issued by the Contracting Officer.

26. Order of Provisions

In the event of a conflict between these General Conditions and the Specifications, the General Conditions shall prevail. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

27. Payments

- (a) The PHA shall pay the Contractor the price as provided in this contract.
- (b) The PHA shall make progress payments approximately every 30 days as the work proceeds, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer. The PHA may, subject to written determination and approval of the Contracting Officer, make more frequent payments to contractors which are qualified small businesses.
- (c) Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by the Contracting Officer, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a

basis for determining progress payments. The breakdown shall be approved by the Contracting Officer and must be acceptable to HUD. If the contract covers more than one project, the Contractor shall furnish a separate breakdown for each. The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price. The Contractor shall prorate its overhead and profit over the construction period of the contract.

- (d) The Contractor shall submit, on forms provided by the PHA, periodic estimates showing the value of the work performed during each period based upon the approved submitted not later than _____ days in advance of the date set for payment and are subject to correction and revision as required. The estimates must be approved by the Contracting Officer with the concurrence of the Architect prior to payment. If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.
- (e) Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made: I hereby certify, to the best of my knowledge and belief, that:
 - (1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;
 - (2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and,
 - (3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

Name:

Title:

Date:

- (f) Except as otherwise provided in State law, the PHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract; except, that if upon completion of 50 percent of the work, the Contracting Officer, after consulting with the Architect, determines that the Contractor's performance and progress are satisfactory, the PHA may make the remaining payments in full for the work subsequently completed. If the Contracting Officer subsequently determines that the Contractor's performance and progress are unsatisfactory, the PHA shall reinstate the ten (10) percent (or other percentage as provided in State law) retainage until such time as the Contracting Officer determines that performance and progress are satisfactory.
- (g) The Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration when computing progress payments.

Material delivered to the Contractor at locations other than the site may also be taken into consideration if the Contractor furnishes satisfactory evidence that (1) it has acquired title to such material; (2) the material is properly stored in a bonded warehouse, storage yard, or similar suitable place as may be approved by the Contracting Officer; (3) the material is insured to cover its full value; and (4) the material will be used to perform this contract. Before any progress payment which includes delivered material is made, the Contractor shall furnish such documentation as the Contracting Officer may require to assure the protection of the PHA's interest in such materials. The Contractor shall remain responsible for such stored material notwithstanding the transfer of title to the PHA.

- (h) All material and work covered by progress payments made shall, at the time of payment become the sole property of the PHA, but this shall not be construed as (1) relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or, (2) waiving the right of the PHA to require the fulfillment of all of the terms of the contract. In the event the work of the Contractor has been damaged by other contractors or persons other than employees of the PHA in the course of their employment, the Contractor shall restore such damaged work without cost to the PHA and to seek redress for its damage only from those who directly caused it.
- (i) The PHA shall make the final payment due the Contractor under this contract after (1) completion and final acceptance of all work; and (2) presentation of release of all claims against the PHA arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. Each such exception shall embrace no more than one claim, the basis and scope of which shall be clearly defined. The amounts for such excepted claims shall not be included in the request for final payment. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned.
- (j) Prior to making any payment, the Contracting Officer may require the Contractor to furnish receipts or other evidence of payment from all persons performing work and supplying material to the Contractor, if the Contracting Officer determines such evidence is necessary to substantiate claimed costs.
- (k) The PHA shall not; (1) determine or adjust any claims for payment or disputes arising there under between the Contractor and its subcontractors or material suppliers; or, (2) withhold any moneys for the protection of the subcontractors or material suppliers. The failure or refusal of the PHA to withhold moneys from the Contractor shall in no wise impair the obligations of any surety or sureties under any bonds furnished under this contract.

28. Contract Modifications

- (a) Only the Contracting Officer has authority to modify any term or condition of this contract. Any contract modification shall be authorized in writing.
- (b) The Contracting Officer may modify the contract unilaterally (1) pursuant to a specific authorization stated in a contract clause (e.g., Changes); or (2) for administrative matters which do not change the rights or

responsibilities of the parties (e.g., change in the PHA address). All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and the Contracting Officer.

- (c) When a proposed modification requires the approval of HUD prior to its issuance (e.g., a change order that exceeds the PHA's approved threshold), such modification shall not be effective until the required approval is received by the PHA.

29. Changes

- (a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract including changes:
 - (1) In the specifications (including drawings and designs);
 - (2) In the method or manner of performance of the work;
 - (3) PHA-furnished facilities, equipment, materials, services, or site; or,
 - (4) Directing the acceleration in the performance of the work.
- (b) Any other written order or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances and source of the order and (2) that the Contractor regards the order as a change order.
- (c) Except as provided in this clause, no order, statement or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.
- (d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a adjustment based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days (5 days for oral orders) before the Contractor gives written notice as required. In the case of defective specifications for which the PHA is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.
- (e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause, or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting a written statement describing the general nature and the amount of the proposal. If the facts justify it, the Contracting Officer may extend the period for submission. The proposal may be included in the notice required under paragraph (b) above. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.
- (f) The Contractor's written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract in at least the following details:

- (1) Direct Costs. Materials (list individual items, the quantity and unit cost of each, and the aggregate cost); Transportation and delivery costs associated with materials; Labor breakdowns by hours or unit costs (identified with specific work to be performed); Construction equipment exclusively necessary for the change; Costs of preparation and/ or revision to shop drawings resulting from the change; Worker's Compensation and Public Liability Insurance; Employment taxes under FICA and FUTA; and, Bond Costs when size of change warrants revision.
- (2) Indirect Costs. Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.
- (3) Profit. The amount of profit shall be negotiated and may vary according to the nature, extent, and complexity of the work required by the change. The allowability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this contract. The Contractor shall not be allowed a profit on the profit received by any subcontractor. Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs. On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the work.
- (g) The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the contract in its entirety.
- (h) The Contracting Officer shall act on proposals within 30 days after their receipt, or notify the Contractor of the date when such action will be taken.
- (i) Failure to reach an agreement on any proposal shall be a dispute under the clause entitled Disputes herein. Nothing in this clause, however, shall excuse the Contractor from proceeding with the contract as changed.
- (j) Except in an emergency endangering life or property, no change shall be made by the Contractor without a prior order from the Contracting Officer.

30. Suspension of Work

- (a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the PHA.
- (b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified (or within a reasonable time if not specified) in this contract an adjustment shall be made for any increase in the cost of performance of the contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have

been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this contract.

- (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and, (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

31. Disputes

- (a) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. A claim arising under the contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim. The submission may be converted to a claim by complying with the requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.
- (b) Except for disputes arising under the clauses entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this clause.
- (c) All claims by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the PHA against the Contractor shall be subject to a written decision by the Contracting Officer.
- (d) The Contracting Officer shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.
- (e) The Contracting Officer's decision shall be final unless the Contractor (1) appeals in writing to a higher level in the PHA in accordance with the PHA's policy and procedures, (2) refers the appeal to an independent mediator or arbitrator, or (3) files suit in a court of competent jurisdiction. Such appeal must be made within (30 unless otherwise indicated) days after receipt of the Contracting Officer's decision.
- (f) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

32. Default

- (a) If the Contractor refuses or fails to prosecute the work, or any separable part thereof, with the diligence that will insure its completion within the time specified in this contract, or any extension thereof, or fails to complete said work within this time, the Contracting Officer may, by written notice to the Contractor, terminate the right to

proceed with the work (or separable part of the work) that has been delayed. In this event, the PHA may take over the work and complete it, by contract or otherwise, and may take possession of and use any materials, equipment, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the PHA resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the PHA in completing the work.

- (b) The Contractor's right to proceed shall not be terminated or the Contractor charged with damages under this clause if—
- (1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God, or of the public enemy, (ii) acts of the PHA or other governmental entity in either its sovereign or contractual capacity, (iii) acts of another contractor in the performance of a contract with the PHA, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and
 - (2) The Contractor, within days (10 days unless otherwise indicated) from the beginning of such delay (unless extended by the Contracting Officer) notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of the delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, time for completing the work shall be extended by written modification to the contract. The findings of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Disputes clause of this contract.
- (c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been for convenience of the PHA.

33. Liquidated Damages

- (a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, as specified in the clause entitled Default of this contract, the Contractor shall pay to the PHA as liquidated damages, the sum of \$ _____ [Contracting Officer insert amount] for each day of delay. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed. To the extent that the Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due the PHA. The Contractor remains liable for damages caused other than by delay.
- (b) If the PHA terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final

completion of the work together with any increased costs occasioned the PHA in completing the work.

- (c) If the PHA does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

34. Termination for Convenience

- (a) The Contracting Officer may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of the PHA. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which such termination becomes effective.
- (b) If the performance of the work is terminated, either in whole or in part, the PHA shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by the PHA of a properly presented claim setting out in detail: (1) the total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor; (2) the cost (including reasonable profit) of settling and paying claims under subcontracts and material orders for work performed and materials and supplies delivered to the site, payment for which has not been made by the PHA to the Contractor or by the Contractor to the subcontractor or supplier; (3) the cost of preserving and protecting the work already performed until the PHA or assignee takes possession thereof or assumes responsibility therefore; (4) the actual or estimated cost of legal and accounting services reasonably necessary to prepare and present the termination claim to the PHA; and (5) an amount constituting a reasonable profit on the value of the work performed by the Contractor.
- (c) The Contracting Officer will act on the Contractor's claim within days (60 days unless otherwise indicated) of receipt of the Contractor's claim.
- (d) Any disputes with regard to this clause are expressly made subject to the provisions of the Disputes clause of this contract.

35. Assignment of Contract

The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from the PHA under the contract may be assigned to a bank, trust company, or other financial institution. Such assignments of claims shall only be made with the written concurrence of the Contracting Officer. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by the Contracting Officer.

36. Insurance

- (a) Before commencing work, the Contractor and each subcontractor shall furnish the PHA with certificates of insurance showing the following insurance is in force and will insure all operations under the Contract:
- (1) Workers' Compensation, in accordance with state or Territorial Workers' Compensation laws.
 - (2) Commercial General Liability with a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount]

per occurrence to protect the Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability under (3) below. If the Contractor has a "claims-made" policy, then the following additional requirements apply: the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and the extended reporting period may not be less than five years following the completion date of the Contract.

- (3) Automobile Liability on owned and non-owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than \$ _____ [Contracting Officer insert amount] per occurrence.
- (b) Before commencing work, the Contractor shall furnish the PHA with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force. The Builder's Risk Insurance shall be for the benefit of the Contractor and the PHA as their interests may appear and each shall be named in the policy or policies as an insured. The Contractor in installing equipment supplied by the PHA shall carry insurance on such equipment from the time the Contractor takes possession thereof until the Contract work is accepted by the PHA. The Builder's Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. It need not be carried on landscape work. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by the PHA. The Contractor may terminate this insurance on buildings as of the date taken over for occupancy by the PHA. The Contractor is not required to carry Builder's Risk Insurance for modernization work which does not involve structural alterations or additions and where the PHA's existing fire and extended coverage policy can be endorsed to include such work.
- (c) All insurance shall be carried with companies which are financially responsible and admitted to do business in the State in which the project is located. If any such insurance is due to expire during the construction period, the Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to the Contracting Officer. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to the Contracting Officer.

37. Subcontracts

- (a) Definitions. As used in this contract -
- (1) "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

(2) "Subcontractor" means any supplier, vendor, or firm that furnishes supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

- (b) The Contractor shall not enter into any subcontract with any subcontractor who has been temporarily denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or of the state in which the work under this contract is to be performed.
- (c) The Contractor shall be as fully responsible for the acts or omissions of its subcontractors, and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.
- (d) The Contractor shall insert appropriate clauses in all subcontracts to bind subcontractors to the terms and conditions of this contract insofar as they are applicable to the work of subcontractors.
- (e) Nothing contained in this contract shall create any contractual relationship between any subcontractor and the PHA or between the subcontractor and HUD.

38. Subcontracting with Small and Minority Firms, Women's Business Enterprise, and Labor Surplus Area Firms

The Contractor shall take the following steps to ensure that, whenever possible, subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

- (a) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;
- (b) Ensuring that small and minority businesses and women's business enterprises are solicited whenever they are potential sources;
- (c) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;
- (d) Establishing delivery schedules, where the requirements of the contract permit, which encourage participation by small and minority businesses and women's business enterprises; and
- (e) Using the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

39. Equal Employment Opportunity

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

- (a) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, or handicap.
- (b) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

- (c) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.
- (d) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, or handicap.
- (e) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.
- (f) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.
- (g) The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, Section 503 of the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- (h) In the event of a determination that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts, or Federally assisted construction contracts under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.
- (i) The Contractor shall include the terms and conditions of this clause in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.
- (j) Compliance with the requirements of this clause shall be to the maximum extent consistent with, but not in derogation of, compliance with section 7(b) of the Indian Self-Determination and Education Assistance Act and the Indian Preference clause of this contract.
- 40. Employment, Training, and Contracting Opportunities for Low-Income Persons, Section 3 of the Housing and Urban Development Act of 1968.**
- (a) The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
- (b) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the Part 135 regulations.
- (c) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.
- (d) The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.
- (e) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR Part 135.
- (f) Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
- (g) With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

41. Interest of Members of Congress

No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

42. Interest of Members, Officers, or Employees and Former Members, Officers, or Employees

No member, officer, or employee of the PHA, no member of the governing body of the locality in which the project is situated, no member of the governing body of the locality in which the PHA was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this contract or the proceeds thereof.

43. Limitations on Payments made to Influence Certain Federal Financial Transactions

- (a) The Contractor agrees to comply with Section 1352 of Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, and officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.
- (b) The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

44. Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringement of any patent rights and shall save the PHA harmless from loss on account thereof; except that the PHA shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent, the Contractor shall promptly notify the Contracting Officer. Failure to give such notice shall make the Contractor responsible for resultant loss.

45. Examination and Retention of Contractor's Records

- (a) The PHA, HUD, or Comptroller General of the United States, or any of their duly authorized representatives shall, until 3 years after final payment under this contract, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract for the purpose of making audit, examination, excerpts, and transcriptions.
- (b) The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as paragraph (a) above. "Subcontract," as used in this clause, excludes purchase orders not exceeding \$10,000.
- (c) The periods of access and examination in paragraphs (a) and (b) above for records relating to (1) appeals under the Disputes clause of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the PHA, HUD, or Comptroller General or any of their duly authorized representatives has taken exception shall continue until disposition of such appeals, litigation, claims, or exceptions.

46. Labor Standards - Davis-Bacon and Related Acts

If the total amount of this contract exceeds \$2,000, the Federal labor standards set forth in the clause below shall apply to the development or construction work to be performed under the contract.

- (a) Minimum Wages.
 - (1) All laborers and mechanics employed under this contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall

be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (2) (i) Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met: (A) The work to be performed by the classification requested is not performed by a classification in the wage determination; and (B) The classification is utilized in the area by the construction industry; and (C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
- (ii) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iii) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.
- (iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(2)(ii) or (iii) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in classification.
- (3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
- (4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the

amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

- (b) Withholding of funds. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working in the construction or development of the project, all or part of the wages required by the contract, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.
- (c) Payrolls and basic records.
- (1) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

- (2) (i) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under subparagraph (c)(1) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1214-0149.)
- (ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (A) That the payroll for the payroll period contains the information required to be maintained under paragraph (c) (1) of this clause and that such information is correct and complete;
- (B) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and
- (C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance" required by subparagraph (c)(2)(ii) of this clause.
- (iv) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.
- (3) The Contractor or subcontractor shall make the records required under subparagraph (c)(1) available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to

make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

- (d) (1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- (2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under

the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

- (3) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.
- (e) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.
- (f) Contract termination; debarment. A breach of this contract clause may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.
- (g) Compliance with Davis-Bacon and related Act requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.
- (h) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this clause shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the PHA, HUD, the U.S. Department of Labor, or the employees or their representatives.
- (i) Certification of eligibility.
 - (1) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded contracts by the United States Government by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

- (2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
 - (3) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.
- (j) Contract Work Hours and Safety Standards Act. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.
- (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.
 - (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in subparagraph (j)(1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation of the provisions set forth in subparagraph (j)(1) of this clause, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in subparagraph (j)(1) of this clause.
 - (3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in subparagraph (j)(2) of this clause.
- (k) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in this clause, and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

47. Non-Federal Prevailing Wage Rates

- (a) Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:
 - (1) The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 3141 et seq.) to be prevailing in the locality with respect to such trade;
- (b) An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or
- (c) An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

48. Procurement of Recovered Materials.

- (a) In accordance with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items: (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.
- (b) Paragraph (a) of this clause shall apply to items purchased under this contract where: (1) the Contractor purchases in excess of \$10,000 of the item under this contract; or (2) during the preceding Federal fiscal year, the Contractor: (i) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (ii) purchased a total of in excess of \$10,000 of the item both under and outside that contract.

SUPPLEMENTAL GENERAL CONDITIONS

1. Reference Clause 10, (HUD 5369) - Assurance of Completion, Subparagraph (a)., Item (1):
 - (1) A performance bond and a payment bond in a penal sum of 100 percent (100%) of the contract price are required for execution of the contract. Separate bonds for performance and payment are required.
2. Reference Clause 27, (HUD 5370) - Payments, Subparagraph (f) Change to Read:
 - (f) Except as otherwise provided in State law, the PHA/IHA shall retain ten (10) percent of the amount of progress payments until completion and acceptance of all work under the contract.

BID FORM

Norwood Community Center
Anniston, Alabama
Anniston Housing Authority

Proposal of _____

(hereinafter called "Bidder") (a/an _____ corporation/a partnership/an individual
(State) (Strike out inapplicable terms)

doing business as _____) to

Anniston Housing Authority (hereinafter called "Owner").

Gentlemen:

The Bidder, in compliance with your invitation for bids for the **Norwood Community Center, Anniston, Alabama**. The Bidder, having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within **180** consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of **\$100** for each consecutive calendar day thereafter as hereinafter provided in Paragraph 33 of "General Conditions of the Contract for Construction" HUD-5370 (11-92).

Bidder acknowledges receipt of the following addenda:

Addendum No. _____ Dated _____ Addendum No. _____ Dated _____
Addendum No. _____ Dated _____ Addendum No. _____ Dated _____
Addendum No. _____ Dated _____ Addendum No. _____ Dated _____

BASE PROPOSAL: Bidder agrees to perform all of the work as described in the specifications and shown on the plans for each site as follows:

TOTAL BASE BID: _____
_____ (\$ _____).

(Amounts shall be shown in both words and figures. In case of discrepancy, amount shown in words shall govern.)

ALTERNATE PROPOSALS: (N/A)

UNIT PRICES: (N/A)

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The bidder agrees that this bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract and deliver to the owner the Performance Bond, Labor, and Material Payment Bond and proof of required insurance coverage within 10 days of notification as required by Clause 9 "Instruction to Bidders for contracts Public and Indian Housing Programs" HUD-5369 (10/2002).

The bid security attached in the sum of _____ (\$ _____) is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully Submitted:

NOTE: If bidder is a corporation, set forth the legal name of the corporation together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if bidder is a partnership, set forth the name of the firm together with the signature of the partner or partners authorized to sign contracts on behalf of the partnership.

AL. G.C. LICENSE NO.: _____ PHONE NO.: _____

CONTRACTOR: _____

BUSINESS ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

BIDDER'S SIGNATURE: _____ DATE: _____

(Seal if Bid is by a Corporation)

BID BOND

KNOW all by these presents, that we _____ as Principal,

 (Contractor)
 hereinafter called the Principal, and _____ a corporation

 (Bonding Company)
 duly organized under the laws of the _____ as Surety, hereinafter called the

 (State Organized)
 Surety, are held and firmly bound unto Anniston Housing Authority for the sum of
 _____ Dollars (\$ _____)
 for the payment of which sum well and truly to be made, the said Principal and the said Surety bind
 ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly
 by these presents.

WHEREAS, the Principal has submitted a bid for Norwood Community Center, Anniston, Alabama.

NOW, therefore, if the Anniston Housing Authority shall accept the bid of the Principal and the Principal shall enter into a contract with the Anniston Housing Authority in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract documents with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay the Anniston Housing Authority the difference not to exceed the penalty hereof between the amount hereof between the amount specified in said bid and such amount hereof between the amount specified in said bid and such larger amount for which the Anniston Housing Authority may in good faith contract with another party to work covered by said bid or an appropriate required amount as specified in the Invitation for Bids, then this obligation shall be null and void, otherwise to remain in full force and effect.

**BID BOND
(continued)**

Signed and sealed this _____ day of _____, 2023.

(Principal) (Seal)

(Witness)

(Title)

(Witness)

(Bonding Company)

BY: _____

US Department of Housing and Urban Development
Office of Housing/Federal Housing Commissioner

US Department of Agriculture
Farmers Home Administration

Part I to be completed by Controlling Participant of Covered Projects <i>(See instructions)</i>		For HUD HQ/FmHA use only	
Reason for submission:			
1. Agency name and City where the application is filed		2. Project Name, Project Number, City and Zip Code	
3. Loan or Contract amount \$	4. Number of Units or Beds	5. Section of Act	6. Type of Project (check one) <input type="checkbox"/> Existing <input type="checkbox"/> Rehabilitation <input type="checkbox"/> Proposed (New)

7. List all proposed Controlling Participants and attach organization chart for all organizations

Name and address of Principals and Affiliates (Name: Last, First, Middle Initial) proposing to participate	8 Role of Each Principal in Project	9. SSN or IRS Employer Number

Certifications: The controlling participants(s) listed above hereby apply to HUD or USDA FmHA, as the case maybe, for approval to participate as controlling participant(s) in the role(s) and project listed above. The controlling participant(s) each certify that all the statements made on this form are true, complete and correct to the best of their knowledge and belief and are made in good faith, including any Exhibits attached to this form.

Warning: HUD will prosecute false claims and statements. Conviction may result in criminal and/or civil penalties. The controlling participants(s) further certify that to the best of their knowledge and belief:

1. Schedule A contains a listing, for the last ten years, of every project assisted or insured by HUD, USDA FmHA and/or State and local government housing finance agencies in which the controlling participant(s) have participated or are now participating.
2. For the period beginning 10 years prior to the date of this certification, and except as shown on the certification:
 - a. No mortgage on a project listed has ever been in default, assigned to the Government or foreclosed, nor has it received mortgage relief from the mortgagee;
 - b. The controlling participants have no defaults or noncompliance under any Conventional Contract or Turnkey Contract of Sale in connection with a public housing project;
 - c. There are no known unresolved findings as a result of HUD audits, management reviews or other Governmental investigations concerning the controlling participants or their projects;
 - d. There has not been a suspension or termination of payments under any HUD assistance contract due to the controlling participant's fault or negligence;
 - e. The controlling participants have not been convicted of a felony and are not presently the subject of a complaint or indictment charging a felony. (A felony is defined as any offense punishable by imprisonment for a term exceeding one year, but does not include any offense classified as a misdemeanor under the laws of a State and punishable by imprisonment of two years or less);
 - f. The controlling participants have not been suspended, debarred or otherwise restricted by any Department or Agency of the Federal Government or of a State Government from doing business with such Department or Agency;
 - g. The controlling participants have not defaulted on an obligation covered by a surety or performance bond and have not been the subject of a claim under an employee fidelity bond;
3. All the names of the controlling participants who propose to participate in this project are listed above.
4. None of the controlling participants is a HUD/FmHA employee or a member of a HUD/FmHA employee's immediate household as defined in Standards of Ethical Conduct for Employees of the Executive Branch in 5 C.F.R. Part 2635 (57 FR 35006) and HUD's Standard of Conduct in 24 C.F.R. Part 0 and USDA's Standard of Conduct in 7 C.F.R. Part 0 Subpart B.
5. None of the controlling participants is a participant in an assisted or insured project as of this date on which construction has stopped for a period in excess of 20 days or which has been substantially completed for more than 90 days and documents for closing, including final cost certification, have not been filed with HUD or FmHA.
6. None of the controlling participants have been found by HUD or FmHA to be in noncompliance with any applicable fair housing and civil rights requirements in 24 CFR 5.105(a). (If any controlling participants have been found to be in noncompliance with any requirements, attach a signed statement explaining the relevant facts, circumstances, and resolution, if any).
7. None of the controlling participants is a Member of Congress or a Resident Commissioner nor otherwise prohibited or limited by law from contracting with the Government of the United States of America.
8. Statements above (if any) to which the controlling participant(s) cannot certify have been deleted by striking through the words with a pen, and the controlling participant(s) have initialed each deletion (if any) and have attached a true and accurate signed statement (if applicable) to explain the facts and circumstances.

Name of Controlling Participant	Signature of Controlling Participant	Certification Date (mm/dd/yyyy)	Area Code and Tel. No.
This form prepared by (print name)			Area Code and Tel. No.

Previous Participation Certification

OMB Approval No. 2502-0118

(Exp. 05/31/2019)

Schedule A: List of Previous Projects and Section 8 Contracts. Below is a complete list of the controlling participants' previous participation projects and participation history in multifamily Housing programs of HUD/FmHA, State and local Housing Finance Agencies. **Note:** Read and follow the instruction sheet carefully. Make full disclosure. Add extra sheets if you need more space. Double check for accuracy. If no previous projects, write by your name, **"No previous participation, First Experience"**.

1. Controlling Participants' Name (Last, First)	2. List of previous projects (Project name, project ID and, Govt. agency involved)	3. List Participants' Role(s) (indicate dates participated, and if fee or identity of interest participant)	4. Status of loan (current, defaulted, assigned, foreclosed)	5. Was the Project ever in default during your participation Yes No If yes, explain		6. Last MOR rating and Physical Insp. Score and date

Part II- For HUD Internal Processing Only

Received and checked by me for accuracy and completeness; recommend approval or refer to Headquarters after checking appropriate box.

Date (mm/dd/yyyy)	Tel No. and area code	<input type="checkbox"/> A. No adverse information; form HUD-2530 approval recommended. <input type="checkbox"/> C. Disclosure or Certification problem	
Staff	Processing and Control	<input type="checkbox"/> B. Name match in system <input type="checkbox"/> D. Other (attach memorandum)	
Signature of authorized reviewer		Signature of authorized reviewer	
		Approved <input type="checkbox"/> Yes <input type="checkbox"/> No	
		Date (mm/dd/yyyy)	

Instructions for Completing the Previous Participation Certificate, form HUD-2530

Carefully read these instructions and the applicable regulations. A copy of those regulations published at 24 C.F.R. part 200, subpart H, can be obtained on-line at www.gpo.gov and from the Account Executive at any HUD Office. Type or print neatly in ink when filling out this form. Mark answers in all blocks of the form. If the form is not filled completely, it will delay approval of your application.

Attach extra sheets as you need them. Be sure to indicate "Continued on Attachments" wherever appropriate. Sign each additional page that you attach if it refers to you or your record. **Carefully read the certification before you sign it.** Any questions regarding the form or how to complete it can be answered by your HUD Account Executive.

Purpose: This form provides HUD with a certified report of all previous participation in HUD programs by those parties making application. The information requested in this form is used by HUD to determine if you meet the standards established to ensure that all controlling participants in HUD projects will honor their legal, financial and contractual obligations and are acceptable risks from the underwriting standpoint of an insurer, lender or governmental agency. HUD requires that you certify your record of previous participation in HUD/USDA-FmHA, State and Local Housing Finance Agency projects by completing and signing this form, before your project application or participation can be approved.

HUD approval of your certification is a necessary precondition for your participation in the project and in the capacity that you propose. If you do not file this certification, do not furnish the information requested accurately, or do not meet established standards, HUD will not approve your certification.

Note that approval of your certification does not obligate HUD to approve your project application, and it does not satisfy all other HUD program requirements relative to your qualifications.

Who Must Sign and File Form HUD-2530: Form HUD-2530 must be completed and signed by all Controlling Participants of Covered Projects, as such terms are defined in 24 CFR 200.212, and as further clarified by the Processing Guide referenced in 24 CFR 200.210(b) and made available on the HUD website at: http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/mfh/prevparticipation.

Where and When Form HUD-2530 Must Be Filed: The original of this form must be submitted to the HUD Office where your project application will be processed at the same time you file your initial project application. This form must be filed with applications for projects listed in 24 CFR 200.214 and for the Triggering Events listed at 24 CFR 200.218.

Review of Adverse Determination: If approval of your participation in a HUD project is denied, withheld, or conditionally granted on the basis of your record of previous participation, you will be notified by the HUD Office. You may request reconsideration in accordance with 24 CFR 200.222 and further clarified by the Processing Guide. Request must be made in writing within 30 days from your receipt of the notice of determination.

Specific Line Instructions are set forth in the Processing Guide.

The Department of Housing and Urban Development (HUD) is authorized to collect this information by law (42 U.S.C. 3535(d) and 24 C.F.R. 200.217) and by regulation at 24 CFR 200.210. This information is needed so that principals applying to participate in multifamily programs can become HUD-approved controlling participants. The information you provide will enable HUD to evaluate your record with respect to established standards of performance, responsibility and eligibility. Without prior approval, a controlling participant may not participate in a proposed or existing multifamily or healthcare project. HUD uses this information to evaluate whether or not controlling participants pose an unsatisfactory underwriting risk. The information is used to evaluate the potential controlling participants and approve only individuals and organizations that will honor their legal, financial and contractual obligations.

Privacy Act Statement: The Housing and Community Development Act of 1987, 42 U.S.C. 3543 requires persons applying for a Federally-insured or guaranteed loan to furnish his/her Social Security Number (SSN). HUD must have your SSN for identification of your records. HUD may use your SSN for automated processing of your records and to make requests for information about you and your previous records with other public agencies and private sector sources. HUD may disclose certain information to Federal, State and local agencies when relevant to civil, criminal, or regulatory investigations and prosecutions. It will not be otherwise disclosed or released outside of HUD, except as required and permitted by law. You must provide all of the information requested in this application, including your SSN.

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. This agency may not collect this information, and you are not required to complete this form, unless it displays a currently valid OMB control number.

A response is mandatory. Failure to provide any of the information will result in your disapproval of participation in this HUD program.

**NON-COLLUSIVE AFFIDAVIT
(Contractor's form)**

State of _____

County of _____

_____, being first duly sworn, deposes and says that he is _____, the party making the foregoing proposal or bid,
(a partner or officer of the firm, etc.)

that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against **Anniston Housing Authority** of any
(Local Housing Authority)
person interested in the proposed contract and that all statements in said proposal or bid are true.

(Bidder, if the bidder is individual;
Partner, if the bidder is a partnership;
Officer, if the bidder is a corporation)

Notary Public

Subscribed and sworn to before me this _____ day of _____, 2023.

My commission expires _____.

**NON-COLLUSIVE AFFIDAVIT
(Subcontractor's form)**

State of _____

County of _____

_____, being first duly sworn, deposes and says that he is _____, the party making the foregoing proposal or bid,
(a partner or officer of the firm, etc.)

that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix overhead, profit or cost element of said bid price, or of that of any other bidder, or to secure any advantage against **Anniston Housing Authority** of any
(Local Housing Authority)
person interested in the proposed contract and that all statements in said proposal or bid are true.

(Bidder, if the bidder is individual;
Partner, if the bidder is a partnership;
Officer, if the bidder is a corporation)

Notary Public

Subscribed and sworn to before me this _____ day of _____, 2023.

My commission expires _____.

PERFORMANCE BOND

Bond No. _____.

KNOW all by these presents that

(Here insert full name and address or legal title of Contractor)

as Principal, hereinafter called Contractor, and _____,
(Bonding Company)

a corporation duly organized under the laws of the state of _____, a Surety,
(State Organized)

hereinafter called Surety, are held and firmly bound unto the **Anniston Housing Authority**, as Obligee, in the amount of _____ Dollars (\$ _____), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, Contractor has by written agreement dated _____, 2023, entered into a contract with the **Anniston Housing Authority** for **Norwood Community Center, Anniston, Alabama** in accordance with drawings and specifications prepared by TDA Architects, LLC, 125 West Columbus Street, Dadeville AL 36853, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, therefore, the condition of this obligation is such that, if Contractor shall promptly and faithfully perform said Contract then this obligation shall be null and void; otherwise it shall remain in full force and effect. The Surety hereby waives notice of any such alteration of extension of time made

by the **Anniston Housing Authority**, and its obligation is not affected by any such alteration or extension provided the same is within the scope of the Contract. Whenever Contractor shall be, and is declared by, the **Anniston Housing Authority**, to be in default under the Contract, the **Anniston Housing Authority**, having performed the **Anniston Housing Authority** obligations thereunder, the Surety may promptly remedy the default or shall promptly:

- 1) Complete the Contract in accordance with its terms and conditions; or
- 2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by the **Anniston Housing Authority**, and the Surety jointly of the lowest responsive, responsible bidder, arrange for a Contract between such bidder and

the **Anniston Housing Authority**, and make available as work progresses (even though there should be a default or succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term, "balance of the contract price," as used in this paragraph, shall mean the

total amount payable by the **Anniston Housing Authority**, to Contractor under the Contract and any amendments thereunto, less the amount property paid the **Anniston Housing Authority** by the Contractor. No right of action shall accrue on this bond to or for the use of any person or corporation other than the **Anniston Housing Authority** successors of the **Anniston Housing Authority**.

Signed and sealed this _____ day of _____, 2023.

(Witness)

(Principal) (Seal)

(Title) (Bonding Company)

(Witness)

BY: _____
(Attorney-in-Fact)

LABOR AND MATERIAL PAYMENT BOND

Bond No. _____

KNOW all by these presents that _____ as

(Here insert full name and address or legal title of Contractor)

Principal, hereinafter called Principal, and _____, a corporation duly organized under the laws of the state of _____, as Obligee, (State Organized)

hereinafter called the **Anniston Housing Authority** for the use and benefit of claimants as herein below defined, in the amount of _____ Dollars (\$ _____)

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____, 2023, entered into a contract with the **Anniston Housing Authority** for **Norwood Community Center, Anniston, Alabama**.

(Describe project and insert project number)

in accordance with drawings and specifications prepared by TDA Architects, LLC, 125 West Columbus Street, Dadeville, Alabama 36853, which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, therefore, the condition of this obligation is such that, if promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- 1) A claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental of equipment directly applicable to the Contract.
- 2) The above-named Principal and Surety hereby jointly and severally agree with the **Anniston Housing Authority** that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The **Anniston Housing Authority** shall not be liable for payment of any costs or expenses of any such suit.

- 3) No suit or action shall be commenced herein under by any claimant:
- a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the **Anniston Housing Authority**, or the Surety above named, within ninety (90) days after such claimant did or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be personally served or served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal at any place the Principal maintains an office or conducts its business.
 - b) After the expiration of one (1) year following the date on which the last of the labor was performed or material was supplied by the party bringing suit.
 - c) Other than in a court of competent jurisdiction for the county or district in which the construction contract was to be performed.
- 4) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith herein under, inclusive of the payment or payments made in good faith herein under, inclusive of the payment by Surety of mechanics; liens which may be filled or record against said improvement, weather or not claim for the amount of such lien be presented under the against this bond.

Signed and sealed this _____ day of _____, 2023.

(Witness)

(Principal) (Seal)

(Title) (Bonding Company)

(Witness)

BY: _____
(Attorney-in-Fact)

CONTRACT

THIS AGREEMENT, made this _____ day of _____, **2023**, by and between **Anniston Housing Authority**, herein called "Owner", acting herein through its **Contracting Officer**, and _____, a corporation of _____, County of _____, and State of _____, herein called "Contractor".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER. The CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows:

**Norwood Community Center
Anniston, Alabama
Anniston Housing Authority**

hereinafter called the Project, for the sum of _____ dollars (**\$** _____) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at its own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by **TDA Architects, LLC.**, herein entitled the Architect/Engineer.

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" by the OWNER and to fully complete the project within **180** consecutive calendar days thereafter. The CONTRACTOR further agrees to pay, as liquidated damages, the sum of **\$ 100** per day thereafter as hereinafter provided in Paragraph 17 of "Instructions to Bidders".

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract, and to make payments on account thereof as provided in Paragraph 8, "Payments to Contractor," of the General Conditions.

IN WITNESS WHEREOF, the parties to those present have executed this contract in three

(3) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal)

Attest:

(Secretary)

(Witness)

Anniston Housing Authority
(Owner)

By: _____
Willie B. McMahan, Jr.

Executive Director
(Title)

(Seal)

(Secretary)

(Witness)

(Contractor)

By: _____

President
(Title)

(Address)

NOTE: Secretary of the Owner should attest. If Contractor is a corporation, Secretary should attest.

"General Decision Number: AL20230084 01/27/2023

Superseded General Decision Number: AL20220084

State: Alabama

Construction Type: Building

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Calhoun County in Alabama.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<ul style="list-style-type: none"> . Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this

wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/06/2023
1	01/27/2023

ASBE0078-001 09/30/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 29.65	15.11

BOIL0108-001 01/01/2021

	Rates	Fringes
BOILERMAKER.....	\$ 30.49	23.13

ENGI0312-001 10/01/2013

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
Crane.....	\$ 27.05	11.38
Forklift.....	\$ 26.05	11.38

* IRON0092-003 09/01/2022

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	\$ 31.11	13.13

* IRON0092-007 09/01/2022

	Rates	Fringes
IRONWORKER, REINFORCING.....	\$ 31.11	13.13

* SUAL2015-012 08/02/2017

	Rates	Fringes
BRICKLAYER.....	\$ 22.00	0.00
CARPENTER.....	\$ 15.72 **	1.85
CEMENT MASON/CONCRETE FINISHER...	\$ 18.91	4.39
ELECTRICIAN.....	\$ 17.72	2.31

LABORER: Common or General.....	\$ 12.93 **	0.00
LABORER: Mason Tender - Brick...	\$ 12.22 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 14.23 **	0.00
LABORER: Pipelayer.....	\$ 15.59 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	\$ 21.48	11.20
OPERATOR: Bulldozer.....	\$ 19.96	0.40
OPERATOR: Grader/Blade.....	\$ 17.52	0.89
OPERATOR: Loader.....	\$ 14.69 **	0.00
OPERATOR: Roller.....	\$ 14.00 **	1.78
PAINTER (Brush and Roller).....	\$ 15.31 **	1.41
PAINTER: Spray.....	\$ 14.31 **	0.00
PIPEFITTER.....	\$ 20.78	5.04
PLUMBER.....	\$ 18.97	0.36
ROOFER.....	\$ 13.66 **	0.00
SHEET METAL WORKER, Includes HVAC Duct Installation.....	\$ 23.25	4.17
TILE SETTER.....	\$ 20.00	0.00
TRUCK DRIVER: Dump Truck.....	\$ 13.60 **	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====
** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$16.20) or 13658 (\$12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including

preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates

the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISIO"

**FORM OF
ADVERTISEMENT OF COMPLETION**

Legal Notice

In accordance with Section 16, Title 50 Code of Alabama, 1940, notice is hereby given that
_____ Contractor(s) have completed
the Contract for (Construction, Reconstruction, Alteration, Equipment, or Improvements) of

(insert location data in County of City)

for **The Anniston Housing Authority**, Owner(s), and have made request for final settlement of
said Contract.

Contractor(s)

SECTION 3 CLAUSE

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

- A. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3).
The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3 shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
- B. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.
- C. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person (s) taking applications for each of the positions; and the anticipated date the work shall begin.
- D. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulation in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.
- E. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.
- F. Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

AHA has identified two ways that contractors and consultants may choose to satisfy Section 3 requirements.

- A. Direct employment of qualified candidates (preferred method of participation)
AHA promotes family self-sufficiency and strongly encourages the direct hiring of qualified residents from the communities (Public Housing, Housing Choice Voucher and by Tax Credit residents) impacted by work awarded to contractors and subcontractors. All developers, general contractors and /or subcontractors shall ensure that 30% of new hires will be Section 3 residents.
- B. Contribution to AHA Section 3 Resident Training Fund.
Smaller contractors and consultants may contribute to AHA's Section 3 training fund in an amount based on the Resident Hiring Scale contained in AHA Section 3 Policy. The current hiring scale is a minimum \$250 or a maximum 1.5% of the labor dollars.

**SECTION 00750
SUPPLEMENTARY GENERAL CONDITIONS**

PART 1 - GENERAL

1.1 SUMMARY

- A. The following supplements modify, delete and/or add to the General Conditions, Section 00700. The paragraphs or subparagraphs modified herein shall be added thereto, amended, voided, or superseded as herein instructed.

PART 2 - SPECIFIC MODIFICATIONS

2.1 PARAGRAPH 1 - DEFINITIONS:

- A. Revise Subparagraph 1 (h) as follows:
 - 1. "(h) The terms "LHA", "PHA", "HA", "LA", "Local Authority", or "Housing Authority" are synonymous with the term "Owner" and shall mean ANNISTON HOUSING AUTHORITY, as organized under applicable State law."

2.2 PARAGRAPH 2 - Contractor's Responsibility for Work:

- A. Add to Subparagraph 2(e) the following sentences as condition to fitting and coordination of work.
 - 1. "Contractor shall be responsible for proper fitting of all work for coordination of operations of all trades, subcontractors, or material men employed by him engaged upon the Work. He shall be prepared to guarantee to each of his subcontractors the dimensions required for fitting of their work to all surrounding work, and shall do all cutting, fitting, adjusting, and patching as necessary to make the several parts of the Work come together properly and to fit the work to receive, or be received by, that of other contractors."
- B. Add Subparagraph 2(i) as to mutual responsibility of contractors.
 - 1. "(i) If, through acts or neglect on the part of the Contractor, any other contractor or subcontractor shall suffer loss or damage on the work. The agreement or arbitration, if such other contractor will so settle. If such other contractor or subcontractor shall assert any claim against the Owner on account of any damages alleged to have been so sustained, the Owner shall notify the Contractor, who shall defend, at his own expense, any suit based upon such claim and pay all costs and expenses in connection therewith."

2.3 PARAGRAPH 3 - Architect's Duties, Responsibilities and Authority:

- A. Add Subparagraph (d) as follows:
 - 1. "(d) The Architect does not have the authority to stop the work or any part thereof. Only the PHA/LA has the authority to stop the work or any part thereof. If the Contractor stops work due to an observation or report by the Architect, he does so at his sole discretion and neither the PHA/LA nor the Architect shall be liable for any delays or costs resulting therefrom."

2.4 PARAGRAPH 8 - Differing Site Conditions:

- A. Add Subparagraph 8(e) to clarify responsibility for live utilities and other property:
 - 1. "(e) Contractor shall assume all responsibility for damage to any property upon, or passing through, the site but excluded from the Work or not owned by the Owner, such as utility lines or like items. Where disconnections of underground services are required to be made at street mains, Contractor shall, at his own expense, restore paving, curb, gutter, etc., over such cuts in accordance with local regulations."

2.5 PARAGRAPH 9 - Specifications and Drawings for Construction:

- A. "(j) The Owner will furnish, free of charge, to the Contractor five (5) copies of the Drawings and Project Manual. Additional copies requested by the Contractor will be furnished at the cost of reproduction, plus shipping and handling."

2.6 PARAGRAPH 11 - Materials and Workmanship:

- A. Revise Subparagraph 11(a) beginning with the second sentence as follows:
1. "Specific reference in the Technical specifications to article, device, product, material, fixture, form or type, or construction by trade name, make or catalog number shall be interpreted as a mandatory work requirement except where substitutions are specifically allowed or the Technical Specifications are not proprietary in nature. Substitutions for the mandatory items will only be considered if submitted to the Architect at least fifteen (15) days prior to the date of the bid opening. Requests for approval of substitutions in written form and include such detailed information as to provide for a complete comparison of the products. All approved substitutions will be listed by addenda. Only the specified products or those substitutions listed by addenda shall be used in the preparation of the Contractors bid proposal and incorporated into the Work. The approval of substitutions shall be at the sole discretion of the Architect."
- B. Revise the first sentence of Subparagraph 11(b) to read as follows:
1. "When requesting approval for a substitution prior to bid opening, the Contractor shall....."

2.7 PARAGRAPH 12 - Permits and Codes:

- A. "(b) The Contractor shall secure and pay for all permits, fees, licenses, and utility charges for this project necessary for the proper execution and completion of the work. The utility charges shall include all tap-on charges, meter charges, and any other fees or charges required by any utility company or public agency which sets such fees to accomplish all work required by these Contract Documents. Where the Owner can arrange for the issuance of all or part of these permits, fees and licenses without cost to the Contractor, the Contract amount will be reduced accordingly."

2.8 PARAGRAPH 25 - Contract Period:

- A. (a) The following chart shows rain days anticipated in **Anniston, Alabama** each year. These days are included in the time allowed for completion. Only rain days in addition to these will be considered as a time extension to the contract for "unusually severe weather" as provided for in Paragraph 32(b)(1)(x) of the General Conditions.

<u>Month</u>	<u>Rain Days</u>
January	11
February	10
March	11
April	09
May	09
June	10
July	12
August	10
September	08
October	06
November	09
December	10

- B. (b) If the Contractor falls more than thirty (30) days behind in his work, as shown on his progress schedule, and cannot demonstrate, to the satisfaction of the Owner, an effective recover schedule, the Owner reserves the right to terminate his contract under Article 32 of the General Conditions. Refer to Section 01310 for requirements of the Progress Schedule.

2.9 PARAGRAPH 27 - Payments:

- A. Add Subparagraph (I) as follows:
1. "(I) Along with each progress payment, the Contractor shall submit a revised progress schedule as specified in Section 01310. Payment request will not be processed without this schedule attached."

2.10 PARAGRAPH 33 - Liquidated Damages:

- A. Add Subparagraph 33(a)(1) and (2) to establish amount of liquidated damages.
 - 1. "(1) Since the actual amount of damages for any delay in completion are impossible to determine, the Contractor and his sureties hereby agree to be liable for and shall pay to the Owner the sums hereinafter stipulated as fixed, agreed and liquidated damages, for each calendar day of delay until the Work is completed or accepted."
 - 2. "(2) \$75.00 applicable to all work per calendar day per building for each building not completed and accepted by the date established for completion of each phase, by the phasing plan of the Contract Documents."

2.11 PARAGRAPH 36 - Insurance:

- A. Revise Subparagraph 36(a)(2) to require Commercial General Liability Insurance in the amount of \$1,000,000.00.
- B. Revise Subparagraph 36(a)(3) to require Automobile Liability Insurance in the amount of \$500,000.00.

2.12 PARAGRAPH 50 - Communications:

- A. Add Paragraph 50: Communications, with Subparagraphs (a), (b), (c), and (d) as follows:
 - 1. "(a) All notices, demands, request, instructions, approvals, proposals and claims must be in writing."
 - 2. "(b) Any notice to, or demand upon, the Contractor shall be sufficiently given if delivered at the Office of the Contractor (or at such office as he may designate in writing to the Owner), or deposited in the United States mail in a sealed, postage-prepaid envelope, or if delivered with charges prepaid to any telegraph company for transmission, in each case addressed to such office."
 - 3. "(c) All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to:
ANNISTON HOUSING AUTHORITY
500 GLEN ADDIE AVENUE
ANNISTON, ALABAMA 36202
ATTN.: CONTRACTING OFFICER
And any notice to, or demand upon, the Owner shall be sufficiently given so delivered, or deposited in the United States mail in a sealed postage prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission to said person at such address, or to such other representatives that the Owner may subsequently specify in writing to the Contractor for such purpose."
 - 4. "(d) Any such notice shall be deemed to have been given as of the time of actual delivery or (in case of mailing) when the same should have been received in due course of post, or in the case of telegrams, at the time of actual receipt, as the case may be."

2.13 PARAGRAPH 51 - Taxes:

- A. Add Paragraph 51 - Taxes, as follows:
 - 1. "39. Taxes: The Contractor shall include applicable taxes in his bid proposal and the Contract Sum."

2.14 PARAGRAPH 52 - Equal Employment:

- A. Add Paragraph 52 – Equal Employment, as follows:
 - 1. "52. Add provisions for Equal Employment Opportunity, as enumerated in Exhibit "A" following this Section."

END OF SECTION 00750

**SECTION 01010
SUMMARY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Site Office Modifications.
 - 1. Project location: Anniston, Calhoun County, Alabama.
 - 2. Owner: Anniston Housing Authority
500 Glen Addie Avenue
Anniston, AL 36202
- B. Architect Identification: The Contract Documents, dated May 1, 2023, were prepared for the Project by TDA Architects, LLC.
- C. Owner's Representative: The Owner's Representative is Mr. Doug Brooks, Contract Manager.
- D. The Work consists of a new Community Center.

1.3 PROJECT DESCRIPTION

- A. The Anniston Housing Authority, Norwood Community Center.
 - 1. The project consists of site work and new building construction as described in the drawings and specifications.

1.4 CONTRACT

- A. Project will be constructed under a general construction contract.

1.5 WORK SEQUENCE

- A. Work shall commence on the Notice to Proceed date and shall be completed within the allowed time frame.

1.6 USE OF PREMISES

- A. General: Contractor shall have full use of the building site for construction operations during the construction period.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "Master Format" numbering system.
 - 1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows.
 - Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

- a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS - (Not Applicable)

PART 3 - EXECUTION - (Not Applicable)

END OF SECTION 01010

SECTION 01045 CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and other General Requirements sections, apply to the work specified in this section.

1.2 DESCRIPTION OF REQUIREMENTS

- A. Definition: "Cutting-and patching" is hereby defined to include but is not necessarily limited to the cutting and patching of nominally completed and previously existing work, in order to accommodate the coordination of work, or the installation of other work, or to uncover other work for access or inspection, or to obtain samples for testing, or for similar purposes; and is defined to exclude integral cutting-and-patching during the manufacturing, fabricating, erecting and installing process for individual units of work. Drilling the work to install fasteners and similar operations are excluded from the definition of cutting-and-patching.
- B. Refer to other sections of these specifications for specific cutting-and-patching requirements and limitations applicable to individual units of work.
 - 1. Refer to Divisions 15 and 16 Series sections, for additional requirements and limitation of the cutting-and-patching of mechanical and electrical work, respectively. The requirements of this section apply to mechanical and electrical work, unless otherwise indicated.

1.3 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do no cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio.
- B. Operational and Safety Limitations: Do not cut-and-patch operational elements and safety-related components in a manner resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance, or decreased safety.
- C. Visual Requirements: Do not cut-and-patch work which is exposed on the exteriors or exposed in occupied spaces of the building, in a manner resulting in a reduction of visual qualities or resulting in substantial evidence of the cut-and-patch work, both as judged solely by the Architect. Remove and replace work judged by the Architect to be cut-and-patched in a visually unsatisfactory manner.

1.4 SUBMITTALS

- A. Proposals for Cutting-and-Patching: Where prior approval of cutting-and-patching is required, submit proposal will in advance of time work will be performed, and request approval to proceed. Include description of why cutting-and-patching cannot (reasonably) be avoided, how it will be performed, how structural elements (if any) will be reinforced, products to be used, firms and tradesmen to perform the work, approximate dates of the work, and anticipated results in terms of variations from the work as originally completed (structural, operational, visual and other qualities of significance). Where applicable, include cost proposal, suggested alternatives to the cutting-and-patching procedure proposed, and a description of the circumstances which lead to the need for cutting-and-patching.
 - 1. Approval by Architect/Engineer to proceed with proposed cutting-and-patching does not waive right to later required complete removal and replacement of work found to be cut-and-patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Except as otherwise indicated or approved by the Architect/Engineer, provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with

the requirements, and use materials identical with the original materials where feasible and where recognized that satisfactory results can be produced thereby.

PART 3 – EXECUTION

3.1 MATERIALS

- A. Temporary Support: Provide adequate temporary support for work to be cut, to prevent failure. Do not endanger other work.
- B. Protection: Provide adequate protection of other work during cutting-and-patching, to prevent damage; and provide protection of the work from adverse weather exposure.

3.2 CUTTING AND PATCHING

- A. General: Employ skilled tradesmen to perform cutting-and-patching. Except as otherwise indicated or approved by the Architect/Engineer, proceed with cutting-and-patching at the earliest feasible time, in each instance, and perform the work promptly.
- B. Cut work by methods least likely to damage work to be retained and work adjoining. Review proposed procedure with original installer where possible, and comply with his recommendations.
 - 1. In general, where physical cutting action is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
- C. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
- D. Restore exposed finishes of patched areas; and, where necessary, extend finish restoration onto retained work adjoining, in a manner which will eliminate evidence of patching.
 - 1. Where patch occurs in a smooth painted surface, extend final paint coat over the entire unbroken surface containing the patch, after patched area has received prime and base coats.

END OF SECTION 01045

**SECTION 01140
WORK RESTRICTIONS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 USE OF PREMISES

- A. Use of Site: Selective demolition can be initiated and completed by the Contractor in coordination with the Owner. The Owner will designate areas on the site for storage of materials. The Contractor shall be responsible for any security measures related to work in progress or storage of materials
 - 1. Limits: Confine constructions operations to those portions of the site for which work is indicated to take place. The Contractor may execute site improvement work at any time during the construction period. This work must be coordinated with the Owner.

1.3 OCCUPANCY REQUIREMENTS

- A. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.

END OF SECTION 01140

**SECTION 01310
PROJECT MANAGEMENT AND COORDINATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
 - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.

5. Progress meetings.
 6. Pre-installation conferences.
 7. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.
- 1.4 SUBMITTALS
- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Refer to Division 15 Section "Basic Mechanical Materials and Methods" and Division 16 Section "Basic Electrical Materials and Methods" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.
- 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL
- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.
- 1.6 PROJECT MEETINGS
- A. Pre-Bid Meeting: **A Pre-Bid Meeting will be held on XXXXXXXXXXXX at 2:00 p.m. at the Anniston Housing Authority office, 500 Glen Addie Avenue, Anniston, Alabama 36202.** The meeting will be conducted to review the project scope of work and to answer any questions that the contractors may have. It is imperative that a representative from each General Contractor and subcontractor be present.
1. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 2. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 4. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.
- B. Preconstruction Conference: The Architect shall schedule a preconstruction conference at a time convenient to the Owner. The execution of the Construction Contract shall take place at the Preconstruction Conference. The Contractor shall obtain all required bonding dated the day of the conference. The conference shall take place at a convenient location. The Architect and Owner shall review any pertinent information related to a HUD funded project. The Contractor shall review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: The Contractor shall discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Progress cleaning.
 - r. Working hours.
- C. Pre-Installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements.
 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 14) Documentation of information for payment requests.
 3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or

- recognized. Issue revised schedule concurrently with report of each meeting.
- c. Review present and future needs of each contractor present, including the following:
- 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 01310

**SECTION 01320
CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Field condition reports.
 - 5. Special reports.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fagnets: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Submittals Schedule: Submit **four** copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- C. Preliminary Construction Schedule: Submit **four** printed copies.
- D. Preliminary Network Diagram: Submit **four** printed copies large enough to show entire network for entire construction period.
- E. Contractor's Construction Schedule: Submit **four** printed copies of initial schedule large enough to show entire schedule for entire construction period.
- F. CPM Reports: Concurrent with CPM schedule, submit **four** printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - 3. Total Float Report: List of all activities sorted in ascending order of total float.
 - 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- G. Field Condition Reports: Submit **four** copies at time of discovery of differing conditions.
- H. Special Reports: Submit **four** copies at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Pre-scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review time required for review of submittals and resubmittals.
 - 6. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 7. Review time required for completion and startup procedures.
 - 8. Review and finalize list of construction activities to be included in schedule.
 - 9. Review submittal requirements and procedures.
 - 10. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 – PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for **the Notice to Proceed** to date of **Final Completion**.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each building as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than **20** days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Startup and Testing Time: Include not less than 21 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:

- a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Deliveries.
 - g. Installation.
 - h. Tests and inspections.
 - i. Adjusting.
 - j. Curing.
 - k. Startup and placement into final use and operation.
6. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
- a. Permanent space enclosure.
 - b. Completion of mechanical installation.
 - c. Completion of electrical installation.
 - d. Substantial Completion.
7. Other Constraints: Site improvements and landscape development.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.
- 2.3 PRELIMINARY CONSTRUCTION SCHEDULE
- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within **seven** days of date established for **the Notice to Proceed**.
 - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first **60** days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- 2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.
 - B. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than **30** days after date established for **the Notice to Proceed**.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Purchase of materials.
 - c. Delivery.
 - d. Fabrication.
 - e. Installation.
 2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
 10. Dollar value of activity (coordinated with the Schedule of Values).
- E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- F. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts **two days** before each regularly scheduled progress meeting.

2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Meter readings and similar recordings.
 10. Emergency procedures.
 11. Orders and requests of authorities having jurisdiction.
 12. Change Orders received and implemented.
 13. Construction Change Directives received.
 14. Services connected and disconnected.
 15. Equipment or system tests and startups.
 16. Partial Completions and occupancies.
 17. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At **monthly** intervals, update schedule to reflect actual construction progress and activities. Issue schedule **two days** before each regularly scheduled progress meeting or each application for payment.
 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Actual Completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01320

SECTION 01330 SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's and Owner's responsive action.
- B. Informational Submittals: Written information that does not require Architect's and Owner's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings **will not** be provided by the Architect for the Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal.
 - 1. Initial Review: Allow **10** days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow **14** days for initial review of each submittal.
 - 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
 - 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 5. Allow **14** days for processing each resubmittal.
 - 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.

- b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Owner.
 - e. Name and address of Contractor.
 - f. Name and address of subcontractor.
 - g. Name and address of supplier.
 - h. Name of manufacturer.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect. **(Six copies to Architect)**
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **return submittals, without review**, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 – PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit **six** copies of each submittal, unless otherwise indicated. Architect will return **three** copies. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operating and maintenance manuals.
 - k. Compliance with recognized trade association standards.
 - l. Compliance with recognized testing agency standards.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop-work manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches.
 4. Number of Copies: Submit copies of each submittal, as follows:
 - a. Submittal: Submit **six** blue or black-line prints. Architect will return one print.
- D. Samples: Prepare physical units of materials or products, including the following:
 1. Comply with requirements in Division 1 for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.

5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least **six** sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
- E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- F. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

PART 3 – EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.

7. Entity responsible for performing tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Name and signature of laboratory inspector.
 12. Recommendations on retesting and re-inspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.
- D. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
- E. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect **seven** days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 2. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
- C. **Retesting/Re-inspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
- D. **Testing Agency Responsibilities:** Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
 5. Do not perform any duties of Contractor.
- E. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field-curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. **Schedule of Tests and Inspections:** Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within **30** days of date established for the Notice to Proceed.
1. **Distribution:** Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS - (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
 - 2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01600 PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 1 Section "Alternates" for products selected under an alternate.
 - 2. Division 1 Section "References" for applicable industry standards for products specified.
 - 3. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
 - 4. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.

- f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Initial Submittal: Within **21** days after date of commencement of the Work, submit **2** copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. Completed List: Within **30** days after date of commencement of the Work, submit **6** copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. Architect's Action: Architect will respond in writing to Contractor within **15** days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.
 - B. Requests for Approved Equals: **All requests for materials to be considered as an approved equal must be submitted within 10 days prior to bid. No substitutions shall be considered after this deadline.** Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - b. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - c. Samples, where applicable or requested.
 - d. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 2. Architect's Action: Architect will issue an Addendum no later than seven days prior to the Bid Date to address all Approved Equals.
 - a. Use product specified if a proposed substitution is not approved by Addendum.
 - C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.
- 1.5 **QUALITY ASSURANCE**
 - A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- 1.6 **PRODUCT DELIVERY, STORAGE, AND HANDLING**
 - A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 5. Store products to allow for inspection and measurement of quantity or counting of units.
 6. Store materials in a manner that will not endanger Project structure.
 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by construction forces. Coordinate location with Owner.
- 1.7 PRODUCT WARRANTIES
- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Refer to Divisions 2 through 8 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Request for Approved Equals" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer followed by "or approved equal", provide the product named or a substitution that has been approved by Addendum prior to Bid.
 - a. Substitutions will not be considered unless specifically approved by Addendum.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements unless other manufacturers or sources have been approved by Addendum prior to Bid.
 - a. Substitutions will not be considered unless specifically approved by Addendum.

3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - a. Substitutions will not be considered unless specifically approved by Addendum.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - a. Substitutions will not be considered unless specifically approved by Addendum..
5. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
6. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution or "approved equals" if received within **10 days prior to the bid date**. Requests received after this time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 1. Requested substitution does not require extensive revisions to the Contract Documents.
 2. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 3. Substitution request is fully documented and properly submitted.
 4. Requested substitution has been coordinated with other portions of the Work.
 5. Requested substitution provides specified warranty.
 6. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 7. Request is received by the Architect within **10 days prior to the Bid Date**.

2.3 COMPARABLE PRODUCTS

- A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product. **All requests for materials to be considered as an approved equal must be submitted within 10 days prior to bid. No substitutions shall be considered after this deadline.**
 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents, and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. Samples, if requested.

PART 3 - EXECUTION - (Not Applicable)

END OF SECTION 01600

SECTION 01700 EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. **Submit requests on CSI Form 13.2A, "Request for Interpretation."**

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor (if required) to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points

- promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
 - H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
 - I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
 - J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
 - K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.7 STARTING AND ADJUSTING
- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
 - B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
 - C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."
- 3.8 PROTECTION OF INSTALLED CONSTRUCTION
- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
 - B. Comply with manufacturer's written instructions for temperature and relative humidity.
- 3.9 CORRECTION OF THE WORK
- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
 - B. Restore permanent facilities used during construction to their specified condition.
 - C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
 - D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
 - E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

**SECTION 01710
PROJECT CLOSEOUT**

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF CLOSEOUT DOCUMENTS

- A. Prior to approval of final payment on this project the following will be required by the Owner:
1. Six (6) "Periodic Estimate for Partial Payment" forms each complete with original signatures and notarized. Type "Final Payment" at the top of the form.
 2. Three (3) copies of "Certificate of Substantial Completion" form.
 3. Three (3) copies of final certification of completion ("Field Observation Report" indicating no non-conformance).
 4. Four (4) original "Guarantees and Warranties" with original signatures in accordance with Contract Specifications.
 5. Four (4) copies of Certificate of Insurance covering the Warranty period.
 6. Four (4) copies of final acceptance by the local inspection department.
 7. Four (4) copies of "Contractors Affidavit of Payment of Debts and Claims" (if applicable).
 8. One (1) notarized original and two (2) copies of the "Certificate and Release".
 9. Three (3) originals of Certified Proof of Advertisement of Completion - each notarized with original signatures.
 10. One (1) blue-line print of all "as-built" drawings.
 11. One (1) copies of bound specifications to include all changes and addenda; signed, dated and marked "as-built".

Label the back spine and front cover of the binders with the project name, project number and date. NOTE: These binders are to be supplied within 7 days of the date of Substantial Completion.

Do not submit close-out documents piecemeal. Assemble everything required before forwarding to the Architect.

END OF SECTION 01710

**SECTION 01740
FINAL CLEANING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
 - 1. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of Divisions-2 through -16.
- B. General Project closeout requirements are included in Section "Project Closeout".
- C. General clean-up and waste removal requirements are included in Section "Temporary Facilities".
- D. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
 - 1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. General: provide final cleaning operations. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning of equipment and, or furniture.
- B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project.
 - 1. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
 - 2. Remove tools, construction equipment, machinery and surplus material from the site.
 - 3. Remove snow and ice to provide safe access to the building.
 - 4. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 5. Remove debris and surface dust from limited access spaces, including roofs, plenums,

- shafts, trenches, equipment vaults, manholes, attics and similar spaces.
6. Broom clean concrete floors in unoccupied spaces.
 7. Clean, mop and apply finish (wax) to V.C.T., base and similar surfaces as per manufacturers recommendation.
 8. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo if required.
 9. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials, Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 10. Remove labels that are not permanent labels.
 11. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. do not paint over "UL" and similar labels, including mechanical and electrical name plates.
 12. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar drippings and other foreign substances.
 13. Clean plumbing fixtures and ceramic tile to a sanitary condition, free of stains, including stains resulting from water exposure.
 14. Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.
 15. Clean food service equipment to a sanitary condition, ready and acceptable for its intended use.
 16. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.
 17. Leave the Project clean and ready for occupancy.
- C. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- D. Compliance: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in lawful manner.
1. Where extra materials of value remain after completion of associated construction have become the Owner's property, dispose of these materials as directed.

END OF SECTION 01740

**SECTION 02280
SOIL TREATMENT**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Termite control at and around new construction.
- B. Examine all existing construction, and treat infestation or evidence of termite infestation as required.
- C. Coordination of treatment with other required pest control activities.

1.2 RELATED SECTIONS

- A. Section 02220: Earthwork and grading.

1.3 QUALITY ASSURANCE

- A. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solutions.
- B. In addition to the requirements of these Specifications, comply with the manufacturer's instructions and recommendations for the work, including preparation of the substrate and application.

1.4 JOB CONDITIONS

- A. Do not apply soil treatment solution until excavation, filling, and grading operations are complete, except as otherwise required by construction operations.
- B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils, or during inclement weather. Comply with handling and application instructions of the toxicant manufacturer.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01340.
- B. Manufacturer's Installation Instructions: Technical data and application instructions.

1.6 WARRANTY

- A. Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites, and that if subterranean termite activity is discovered during the warranty period, the Contractor shall re-treat the soil, and repair or replace damage caused by termite infestation.
- B. Provide a written warranty for a period of five (5) years from the date of treatment, signed by the licensed Applicator and the Contractor.

PART 2 PRODUCTS

2.1 SOIL TREATMENT SOLUTION

- A. Use an emulsible concentrate insecticide for dilution with water, specifically formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent.
- B. Provide a working solution of one of the following elements and concentrations:
 - 1. Aldrin; 0.5% in water emulsion.
 - 2. Dieldrin; 0.5% in water emulsion.
 - 3. Petachlor; 0.5% in water emulsion.
- C. Other solutions may be used as recommended by the Applicator provided such solutions are approved by the local governing authorities.
- D. Use only soil treatment solutions which are not injurious to planting.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

- A. Remove foreign matter which could decrease effectiveness of treatment from the application area.
- B. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations.
- C. Toxicant may be applied before placement of compacted fill under slabs, if recommended by the toxicant manufacturer.
- D. Reapply soil treatment solution to areas where solution was previously applied and subsequently disturbed by excavation or other construction activities.

3.2 APPLICATION

- A. For slab-on-grade structures, apply treatment as follows:
 - 1. Treat soil before concrete slabs are placed using either a power sprayer or tank-type garden sprayer.
 - 2. Apply 4 gallons of chemical solution per 10 lineal feet as an overall under slab treatment such as, along the inside of foundation walls, along both sides of interior partition walls, and around plumbing, etc.
 - 3. Apply 4 gallons of chemical solution per 10 lineal feet of trench for each foot of depth from grade to footing, along the outside edge of the building. Dig a trench 6" to 8" wide along the outside of the foundation to a minimum depth of 12". Punch holes to top of footing at not more than 12" o.c., and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench.
- B. Allow a minimum of 12 hours for drying after application, and before beginning concrete placement or other construction activities.

3.3 SIGNS

- A. Post signs in areas of application warning workers and visitors that soil poisoning has been applied.
- B. Remove signs when treated areas are covered by other construction.

END OF SECTION 02280

SECTION 02300 EARTHWORK

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:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling trenches within building lines.
 - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 1 Section "Unit Prices" for a schedule of unit prices.
 - 2. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
 - 3. Division 2 Section "Excavation Support and Protection."
 - 4. Division 2 Section "Foundation Drainage Systems" for drainage of footings, slabs-on-grade, and walls.
 - 5. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.
 - 6. Division 15 and 16 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

1.3 UNIT PRICES

- A. Unit prices for rock excavation include replacement with approved materials.

1.4 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the sub base course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing,

trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

- I. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material 3/4 cu. yd. or more in volume that when tested by an independent geotechnical testing agency, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2 inches.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Drainage fabric.
 - 3. Separation fabric.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- B. Pre-excavation Conference: Conduct a Pre-excavation Conference at the Project site.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.

- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1- inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Warning Tape: Coordinate with local utilities for requirements.
- B. Detectable Warning Tape: Coordinate with local utilities for requirements.
- C. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
 - 2. Tear Strength: 40 lbf; ASTM D 4533.
 - 3. Puncture Resistance: 50 lbf.; ASTM D 4833.
 - 4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
 - 5. Apparent Opening Size: No. 50; ASTM D 4751.
- D. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf ; ASTM D 4632.
 - 2. Tear Strength: 75 lbf ; ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf ; ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D 4491.
 - 5. Apparent Opening Size: No. 30; ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- 3.3 EXPLOSIVES
- A. Explosives: Do not use explosives.
- 3.4 EXCAVATION, GENERAL
- A. Classified Excavation: Excavation to subgrade elevations classified as earth and rock. Rock excavation will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.
 1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
 2. Rock excavation includes removal and disposal of rock.
 - a. Do not excavate rock until it has been classified and cross-sectioned by Architect.
- 3.5 EXCAVATION FOR STRUCTURES
- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.
- 3.6 EXCAVATION FOR WALKS AND PAVEMENTS
- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.
- 3.7 EXCAVATION FOR UTILITY TRENCHES
- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
 - B. Excavate trenches to meet requirements of local utility companies. Coordinate requirements with local utilities.
- 3.8 APPROVAL OF SUBGRADE
- A. Notify Architect when excavations have reached required subgrade.
 - B. If Geotechnician determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
 - D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.
- 3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

- 3.10 STORAGE OF SOIL MATERIALS
 - A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

- 3.11 BACKFILL
 - A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

- 3.12 UTILITY TRENCH BACKFILL
 - A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
 - B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
 - C. Coordinate backfilling with utilities' requirements and testing
 - D. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
 - E. Place and compact final backfill of satisfactory soil material to final subgrade.

- 3.13 FILL
 - A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
 - B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
 - C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under walks and pavements, use satisfactory soil material.
 - 2. Under steps and ramps, use engineered fill.
 - 3. Under building footings, foundations & slabs, use engineered fill.

- 3.14 MOISTURE CONTROL
 - A. See Geotechnical Engineer's report for recommendations.

- 3.15 COMPACTION OF BACKFILLS AND FILLS
 - A. See Geotechnical Engineer's report for recommendations.

- 3.16 GRADING
 - A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Walks: Plus or minus 1 inch.
 2. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
- 3.17 SUBSURFACE DRAINAGE
- A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Foundation Drainage Systems."
- B. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
- 3.18 SUBBASE AND BASE COURSES
- A. Under pavements and walks, place subbase course on separation fabric according to fabric manufacturer's written instructions and as follows:
1. Coordinate with local building authorities for requirements.
- 3.19 DRAINAGE COURSE
- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
- 3.20 FIELD QUALITY CONTROL
- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- 3.21 PROTECTION
- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- 3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS
- A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

**SECTION 02361
TERMITE CONTROL**

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 for termite control:
 - 1. Soil treatment.

1.3 SUBMITTALS

- A. Product Data: Treatments and application instructions, including EPA-Registered Label.
- B. Product Certificates: Signed by manufacturers of termite control products certifying that treatments furnished comply with requirements.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following as applicable:
 - 1. Date and time of application.
 - 2. Moisture content of soil before application.
 - 3. Brand name and manufacturer of termiticide.
 - 4. Quantity of undiluted termiticide used.
 - 5. Dilutions, methods, volumes, and rates of application used.
 - 6. Areas of application.
 - 7. Water source for application.
- E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A PCO who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment in jurisdiction where Project is located and who is experienced and has completed termite control treatment similar to that indicated for this Project and whose work has a record of successful in-service performance.
- B. Regulatory Requirements: Formulate and apply termiticides, and label with a Federal registration number, to comply with EPA regulations and authorities having jurisdiction.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with EPA-Registered Label requirements and requirements of authorities having jurisdiction.

1.6 COORDINATION

- A. Coordinate soil treatment application with excavating, filling, and grading and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs, before construction.

1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in

addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranty: Written warranty, signed by applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
- C. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in a soluble or emulsible, concentrated formulation that dilutes with water or foaming agent, and formulated to prevent termite infestation. Use only soil treatment solutions that are not harmful to plants. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to the product's EPA-Registered Label.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AgrEvo Environmental Health, Inc.; a Company of Hoechst and Schering, Berlin.
 - 2. Bayer Corp.; Garden & Professional Care.
 - 3. DowElanco.
 - 4. FMC Corp.; Pest Control Specialties.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of the soil, interfaces with earthwork, slab and foundation work, landscaping, and
- B. other conditions affecting performance of termite control. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparing substrate. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil and around foundations.
- B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended by termiticide manufacturer.
- C. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute the treatment evenly.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Adjacent soil including soil along entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers, piers, and chimney bases; and along entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
 3. Masonry: Treat voids.
 4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
- B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
- C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- D. Post warning signs in areas of application.
- E. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 02361

**SECTION 03300
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies cast in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for drainage fill under slabs on grade.
 - 2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.03 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mix water to be withheld for later addition at Project site.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- F. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
- G. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
 - 1. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as drawn steel wire into flat sheets.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic protected or CRSI Class 2 stainless steel bar supports.
 - 2. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

2.04 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type as required.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Moderate weathering region, but not less than 3M.
 - 2. Nominal Maximum Aggregate Size: 3/4 inch.
 - 3. Water: Potable and complying with ASTM C 94.

2.05 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
 - 1. Air-Entraining Admixture: ASTM C 260.
 - 2. Water Reducing Admixture: ASTM C 494, type as required to suit project conditions. Only use admixtures which have been tested and accepted in mix designs.

2.06 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class C, polyethylene sheet, ASTM D 4397, not less than 6 mils thick:
 - 1. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.07 RELATED MATERIALS

- A. Joint Filler Strips: ASTM D 1751, asphalt saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non redispersible, acrylic emulsion or styrene butadiene.
 - 1. Types I and II, non load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 2. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- C. Reglets: Fabricate reglets of not less than 0.0217-inch- thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- D. Dovetail Anchor Slots: Hot dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.08 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
- B. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
 - 2. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:
 - a. Compressive Strength (28 Days): 3000 psi.
 - b. Maximum Slump: 4 inches.
 - 3. Slab-on-Grade: Proportion normal-weight concrete mix as follows:
 - a. Compressive Strength (28 Days): 3000 psi.
 - b. Maximum Slump: 5 inches.

2.09 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

- A. Ready Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class B, 1/4 inch.
Construct forms tight enough to prevent loss of concrete mortar.
 - 2. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

3. Do not use rust stained steel form facing material.
4. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike off templates or compacting type screeds.
5. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
6. Chamfer exterior corners and edges of permanently exposed concrete.
7. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
8. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
9. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
10. Coat contact surfaces of forms with form release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast in place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- B. Install anchor bolts, accurately located, to elevations required.
- C. Install reglets to receive top edge of foundation sheet waterproofing and to receive through wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
- D. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 1. 28_day design compressive strength.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
 1. Plan sequence of removal of shores and reshore to avoid damage to

concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- B. Granular Fill: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.07 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
- D. Form from preformed galvanized steel, plastic keyway section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
- E. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- F. Contraction Joints in Slabs-on-Grade: Form weakened plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - 2. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 3. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

4. Install joint filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.08 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete after adding high range water reducing admixtures to mix.
- D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.
- E. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
 1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- G. Cold Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F

- at point of placement.
- 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
- 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- H. Hot Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough Formed Finish: As cast concrete texture imparted by form facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth Formed Finish: As cast concrete texture imparted by form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
- C. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
- D. Do not apply rubbed finish to smooth formed finish.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
- C. Apply float finish to slabs-on-grade.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film finish

coating system

- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
- F. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold weather protection and with recommendations in ACI 305R for hot weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. Ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry pack patching mortar, consisting of one part portland cement to two and one half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
- C. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mix placed each day.
 1. When frequency of testing will provide fewer than five compressive strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
- D. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
- E. Air Content: ASTM C 231, pressure method, for normal weight concrete;

- ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
- F. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - G. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - H. Compressive Strength Tests: ASTM C 39; test two laboratory cured specimens at 7 days and two at 28 days.
 - 1. compressive strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
 - I. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive strength tests equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi.
 - J. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 and 28 day tests.
 - K. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - L. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 03310 CONCRETE

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Codes and Standards: ACI 301 "Specifications for Structural Concrete Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; comply with applicable provisions except as otherwise indicated.
- B. Concrete Testing Service: Employ acceptable testing laboratory to perform materials evaluation, testing and design of concrete mixes.
- C. Employ separate testing laboratory to evaluate concrete delivered to and placed at site.
- D. Certificates, signed by concrete producer and Contractor, may be submitted in lieu of material testing when acceptable to Architect.
- E. Quality Control: Perform sampling and testing during concrete placement, as follows:
- F. Quality Control: Testing laboratory will perform sampling and testing during concrete placement, which may include the following, as directed by Architect. This testing does not relieve Contractor of responsibility of providing concrete in compliance with specifications. Contractor may perform additional testing as necessary, at no expense to Owner, to ensure quality of concrete.
 - 1. Sampling: ASTM C 172.
 - 2. Slump: ASTM C 143, one test for each load at point of discharge.
 - 3. Air Content: ASTM C 173, one for each set of compressive strength specimens.
 - 4. Compressive Strength: ASTM C 39, one set for each 50 cu. yds. or fraction thereof of each class of concrete; one specimen tested at 7 days, one specimen tested at 28 days, and one retained for later testing if required.
 - 5. When the total quantity of a given class of concrete is less than 50 cu. yds., strength tests may be waived by Architect if field experience indicates evidence of satisfactory strength.
- G. Test results will be reported in writing to Architect, Contractor, and concrete producer within 24 hours after tests are made.
- H. Manufacturer's Data: Submit manufacturer's product data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials and others as requested by Architect.
- I. Laboratory Reports: Submit 2 copies of laboratory test or evaluation reports for concrete materials and mix designs.
- J. Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.
 - 1. Submit written report to Architect for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to Architect.
 - 2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Architect.
 - 3. Use air-entering admixture in all concrete, providing not less than 4 percent nor more than 6 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.

1.02 CONCRETE MATERIALS:

- A. Portland Cement: ASTM C 150, Type as required.
- B. Fly Ash: ASTM C 618, Type C or F.
 - 1. Limit use of fly ash in concrete mix design to not exceed 25 percent of cement content by weight.
- C. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to Architect.

- D. Water: Drinkable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Water-Reducing Admixture: ASTM C 494; type as required to suit project conditions. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable.

1.03 RELATED MATERIALS:

- A. Waterstops: Flat dumbbell or centerbulb type, size to suit joints, of either rubber (CRD C 513) or PVC (CRD C 572).
- B. Moisture Barrier: Clear 6-mils thick polyethylene.
- C. Membrane-Forming Curing Compound: ASTM C 309, Type I.
- D. Joint Fillers: See Division-7.

1.04 MATERIALS:

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
- B. Exposed Concrete Surfaces: Suitable material to suit project conditions.

1.05 REINFORCING MATERIALS:

- A. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.
- B. Welded Wire Fabric: ASTM A 185.

1.06 FORMING AND PLACING CONCRETE:

- A. Ready-Mix Concrete: ASTM C 94.
- B. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position.
- C. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.
- D. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.
- E. Reinforcement: Position, support and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- F. Install welded wire fabric in as long lengths as practicable, lapping at least one mesh.
- G. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and random cracking.
- H. Installation of Embedded Items: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided by others for locating and setting.
- I. Concrete Placement: Comply with ACI, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- J. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
- K. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

1.07 CONCRETE FINISHES:

- A. Exposed-to-view Surfaces: Provide a smooth finish for exposed concrete surfaces and surfaces that are to be covered with a coating or covering material applied directly to concrete. Remove

- fins and projections, patch defective areas with cement grout, and rub smooth.
- B. Slab Trowel Finish: Apply trowel finish to monolithic slab surfaces that are exposed-to-view or are to be covered with resilient flooring, paint or other thin film coating. Consolidate concrete surfaces by finish troweling, free of trowel marks, uniform in texture and appearance.
 - C. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

END OF SECTION 03310

**SECTION 05500
METAL FABRICATIONS**

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes the following metal fabrications:
 - 1. Loose bearing and leveling plates.
 - 2. Loose steel lintels.
 - 3. Miscellaneous framing and supports for the following:
 - a. Applications where framing and supports are not specified in other sections.
 - 4. Miscellaneous steel trim.
 - 5. Shelf and relieving angles.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 13 Section "Metal Building Systems" for structural steel framing components of pre-engineered metal building systems.

1.03 DEFINITIONS

- A. Definitions in ASTM E 985 for railing-related terms apply to this section.

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for products used in miscellaneous metal fabrications, including paint products and grout.
- C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.
 - 1. Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.
 - 2. Samples representative of materials and finished products as may be requested by Architect.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Installer Qualifications: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
- C. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction

progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 – PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36.
- C. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade, as follows:
 1. Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
 - a. Grade A, unless otherwise indicated or required by design loading.
 2. Hot-Rolled Structural Steel Sheet: ASTM A 570, grade as follows:
 - a. Grade 30, unless otherwise indicated or required by design loading.
- D. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
 1. Cold-Rolled Steel Sheet: ASTM A 366.
 2. Hot-Rolled Steel Sheet: ASTM A 569
- E. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:
 1. Black finish, unless otherwise indicated.
 2. Galvanized finish for exterior installations and where indicated.
- F. Malleable Iron Castings: ASTM A 47, grade 32510.
- G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
- H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- I. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for the metal alloy to be welded.

2.02 GROUT AND ANCHORING CEMENT

- A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with CE CRD- C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:
 - 1 Nonshrink Nonmetallic Grouts:
 - a. "Bonsal Construction Grout"; W. R. Bonsal Co.
 - b. "Masterflow 713"; Master Builders.
 - c. "Sealtight 588 Grout"; W. R. Meadows, Inc.

2.03 FASTENERS

- A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
- C. Lag Bolts: Square head type, FS FF-B-561.
- D. Machine Screws: Cadmium plated steel, FS FF-S-92.
- E. Wood Screws: Flat head carbon steel, FS FF-S-111.

- F. Plain Washers: Round, carbon steel, FS FF-W-92.
- G. Drilled-In Expansion Anchors: Expansion anchors complying with FS FF-S-325, Group VIII (anchors, expansion, [nondrilling]), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF-B-575, Grade 5.
- H. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class, and style as required.
- I. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

2.04 PAINT

- A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of FS TT-P-645.
- B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

2.05 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - 1. Temperature Change (Range): 100 deg F (55.5 deg C).
- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with AWS recommendations and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

- A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.07 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.08 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, unless otherwise indicated.
- D. Galvanize loose steel lintels located in exterior walls.

2.9 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated or which are not parts of structural steel framework, as required to complete work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide x 1/4 inch x 8 inches long.
- C. Fabricate support for suspended toilet partitions as follows:
 - 1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers, but use not less than C 8 x 11.5 channels or another shape with equivalent structural properties.
 - 2. Hangers: Steel rods, 1/2 inch in diameter, spaced not more than 36 inches o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
 - 3. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.
- D. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.10 MISCELLANEOUS STEEL TRIM

- A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.
- B. Galvanize miscellaneous framing and supports in the following locations:
 - 1. Exterior locations.
 - 2. Interior locations where indicated.

2.11 SHELF AND RELIEVING ANGLES

- A. Fabricate shelf and relieving angles from steel angles of sizes indicated and for attachment to concrete framing. Provide slotted holes to receive $\frac{3}{4}$ inch bolts, spaced not more than 6 inches from ends and not more than 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support shelf/relieving angles from back-up masonry and concrete. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.
- C. Galvanize shelf angles to be installed on exterior concrete framing.
- D. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

2.12 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process compliance with the following requirements:
 - 1. ASTM A 153 for galvanizing iron and steel hardware.
 - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning"
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
 - 1. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.03 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 - 1. Use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.
 - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 ADJUSTING AND CLEANING

- A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 ROUGH CARPENTRY

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:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Wood furring, grounds, nailers, and blocking.
 - 4. Sheathing.
 - 5. Subflooring.
 - 6. Underlayment.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for the following products:
 - 1. Engineered wood products.
 - 2. Underlayment.
 - 3. Insulating sheathing.
 - 4. Air-infiltration barriers.
 - 5. Metal framing anchors.
 - 6. Construction adhesives.
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
 - 1. For each type of preservative-treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
 - 2. For waterborne-treated products, include statement that moisture content of treated materials was reduced to levels indicated before shipment to Project site.
 - 3. For fire-retardant-treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
- E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.
- F. Warranty of chemical treatment manufacturer for each type of treatment.
- G. Research or evaluation reports of the Southern Standard Building Code Congress acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.
 - 1. Engineered wood products.
 - 2. Foam-plastic sheathing.

3. Air-infiltration barriers.
4. Metal framing anchors.
5. Power-driven fasteners.
6. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.
- B. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-retardant-treated wood product from one source and by a single producer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
 1. SPIB - Southern Pine Inspection Bureau.
- C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
- D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 1. Provide dressed lumber, S4S, unless otherwise indicated.
 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 1. Do not use chemicals containing chromium or arsenic.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. Ft.. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

3. Wood framing members less than 18 inches above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations and where indicated.
- D. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.5 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
- B. Non-Load-Bearing Interior Partitions: Provide framing of the following grade and species:
1. Grade: Standard, Stud, or No. 3.
 2. Species: Southern pine; SPIB.
- C. Exterior and Load-Bearing Walls: Provide framing of the following grade and species:
1. Grade: Construction or No. 2.
 2. Species: Southern pine; SPIB.
- D. Ceilings (Non-Load-Bearing): For ceiling framing that does not support a floor, roof, or attic, provide the following grade and species:
1. Grade: Construction or No. 2.
 2. Species: Southern pine; SPIB.
- E. Other Framing Not Listed Above: Provide the following grades and species:
1. Grade: Construction or No. 2.
 2. Species: Southern pine; SPIB.

2.6 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.7 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

- A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.
- B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

2.8 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

- A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
 - 1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
 - 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."
- B. Subflooring: APA-rated sheathing.
 - 1. Exposure Durability Classification: Exterior.
 - 2. Span Rating: As required to suit joist spacing indicated.
- C. Wall Sheathing: APA-rated sheathing.
- D. Roof Sheathing: APA-rated sheathing.
- E. Roof Sheathing: APA-rated Structural I sheathing.

2.9 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch thick.

2.10 STRUCTURAL-USE PANELS FOR UNDERLAYMENT

- A. Plywood Underlayment for Resilient Flooring: For underlayment 19/32 inch thick, provide plywood panels with fully sanded face and as follows:
 - 1. Grade: APA A-C Underlayment Exterior.

2.11 GYPSUM SHEATHING

- A. Gypsum Sheathing Board: Water-resistant-core gypsum sheathing board complying with ASTM C 79 with long edges surfaced with water-repellent paper and as follows:
 - 1. Type: X.
 - 2. Edge Configuration: Square, for vertical application.
 - 3. Thickness: 5/8 inch.

2.12 FOAM-PLASTIC SHEATHING

- A. Extruded Cellular Polystyrene Sheathing: ASTM C 578, Type IV, in manufacturer's standard lengths and widths with T & G or shiplap long edges as standard with manufacturer.
 - 1. Thickness: 1 inch.
- B. Polyisocyanurate Foam Sheathing: Rigid, closed-cell foam board; formed by expanding polyisocyanurate resin using hydrochlorofluorocarbons (HCFCs); with aluminum foil facings laminated to both sides; complying with FS HH-I-1972/1, Class 1 or 2; with a thermal resistance (R-value) for 1-inch thickness of 7.2 deg F x h x sq. ft./Btu at 75 deg F; in thicknesses indicated. Foam-plastic core, 4-1/4 inches thick or less, and facings shall have flame spread of 25 or less, when tested individually.

2.13 AIR-INFILTRATION BARRIER

- A. Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.
- B. Air retarder complying with ASTM E 1677; made from polyolefins; either cross-laminated films, woven strands, or spunbonded fibers; coated or uncoated; with or without perforations to transmit water vapor but not liquid water; and as follows:

1. Minimum Thickness: 3 mils.
2. Minimum Water-Vapor Transmission: 10 perms when tested according to ASTM E 96, Procedure A.
3. Maximum Flame Spread: 25 per ASTM E 84.
4. Minimum Allowable Exposure Time: 3 months.

2.14 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.15 METAL FRAMING ANCHORS

- A. General: Provide galvanized steel framing anchors of structural capacity, type, and size as required and as follows:
 1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.
 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

2.16 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.
- C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other

- construction.
- D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
 - E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. "Table 1705.1--Fastening Schedule," of the Standard Building Code.
 - F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
 - G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
 - H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
- 3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS
- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- 3.3 WOOD FURRING
- A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
 - 1. Firestop furred spaces of walls at each floor level and at ceiling with wood blocking or noncombustible materials, accurately fitted to close furred spaces.
 - B. Furring to Receive Plywood Paneling: Install 1-by-3-inch nominal- size furring at 24 inches o.c., horizontally and vertically. Select furring with no knots capable of producing bent-over nails and damage to paneling.
 - C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring at 16 inches o.c., vertically.
 - D. Furring to Receive Plaster Lath: Install 1-by-2-inch nominal- size furring at 16 inches o.c., vertically.
- 3.4 WOOD FRAMING, GENERAL
- A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
 - B. Install framing members of size and at spacing indicated.
 - C. Do not splice structural members between supports.
 - D. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal- thickness lumber of same width as framing members.
- 3.5 WALL AND PARTITION FRAMING
- A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction, unless otherwise indicated.
 - 1. For exterior walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c., except where otherwise indicated or required.
 - 2. For interior partitions and walls, provide 2-by-4-inch nominal- size wood studs spaced 16 inches o.c., except where otherwise indicated or required.
 - B. Construct corners and intersections with 3 or more studs. Provide miscellaneous blocking and framing as shown and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide continuous horizontal blocking at mid-height of single-story partitions over 96 inches high and multistory partitions, using members of 2-inch nominal thickness and of same width as wall or partitions.
 - C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.
 1. For non-load-bearing partitions, provide double-jamb studs with headers not less than 4-inch nominal depth for openings 36 inches and less in width, and not less than 6-inch nominal depth for wider openings.
 2. For load-bearing walls, provide double-jamb studs for openings 72 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown or, if not shown, as recommended by AFPA's "Manual for Wood Frame Construction."
 - D. Provide bracing in exterior walls, at both walls of each external corner, full-story height, unless otherwise indicated.
- 3.6 INSTALLATION OF STRUCTURAL-USE PANELS
- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 1. Comply with "Code Plus" provisions of above-referenced guide.
 - B. Fastening Methods: Fasten panels as indicated below:
 1. Subflooring: Glue and nail to framing throughout (see plans).
 - a. Space panels 1/8 inch at edges and ends.
 2. Sheathing: Nail to framing.
 - a. Space panels 1/8 inch at edges and ends.
 3. Underlayment: Nail to subflooring.
 - a. Space panels 1/32 inch at edges and ends.
 - b. Fill and sand edge joints of underlayment receiving resilient flooring just before installing flooring.
 4. Plywood Backing Panels: Nail or screw to supports.
- 3.7 FOAM-PLASTIC SHEATHING
- A. Comply with manufacturer's written instructions for applying sheathing. Install vapor relief strips or equivalent for permitting escape of moisture vapor that otherwise would be trapped in stud cavity behind sheathing.
- 3.8 FIBERBOARD SHEATHING
- A. Fasten fiberboard sheathing panels to intermediate supports and then at edges and ends. Use galvanized roofing nails or galvanized staples. Nail or staple to comply with manufacturer's recommended spacing and referenced fastening schedule. Drive fasteners flush with surface of sheathing and locate perimeter fasteners at least 3/8 inch from edges and ends.
 - B. Install 48-by-96-inch or longer sheathing vertically with long edges parallel to, and centered over, studs. Install solid wood blocking where end joints do not occur over framing. Allow 1/8-inch open space between edges and ends of adjacent units. Stagger horizontal joints, if any.
 - C. Apply air-infiltration barrier over sheathing as soon as practical after installation to prevent deterioration from wetting.
- 3.9 AIR-INFILTRATION BARRIER
- A. Cover sheathing with air-infiltration barrier as follows:
 1. Apply air-infiltration barrier to cover upstanding flashing with 4-inch overlap.

END OF SECTION 06100

SECTION 06113 ROOF SHEATHING

PART 1-GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the contract, including General and Supplementary Conditions and General Requirements apply to the work specified in this section.

1.02 SCOPE

- A. Wood roof sheathing replacement.

1.03 QUALITY ASSURANCE

- A. Grading rules of the following associations apply to materials furnished under this section, conform to PS-1.
 - 1. American Plywood Association (APA).
- B. Grade Marks: Identify all plywood by official grade mark.
 - 1. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
 - a. Type, grade, class and identification index.
 - b. Inspection and testing agency mark.

1.04 PRODUCT DELIVERY, STORAGE & HANDLING:

- A. Immediately upon delivery to job site, place materials in area protected from weather.
- B. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect fire-retardant materials against high humidity and moisture during storage and erection.
- E. Protect sheet materials from corners breaking and damaging surfaces, while unloading.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Plywood
 - 1. Exterior graded plywood where edge or surface is permanently exposed to weather and where indicated.
 - 2. Roof sheathing:
 - a. Grade: Standard with exterior glue.
 - b. Identification index: 24/0 or greater.
 - c. ½ inch minimum thickness, or as indicated on the drawings, to match existing.
- B. Building Paper:
 - 1. Asphalt-saturated felt: ASTM D 226 #30 non-perforated.
 - 2. Asphalt-saturated organic felt: ASTM D 250 #30 non-perforated.

PART 3 - EXECUTION

3.01 CONDITIONS OF SURFACES

- A. Verify that surfaces to receive sheathing are level, plumb and prepared to exact grades and dimensions.

3.02 INSTALLATION

A. Roof Sheathing

Plywood Sheathing

- a. Install plywood with face grain perpendicular to supports, using panel with continuous end joints over two or more spans staggered between panels and locate over supports.
- b. Allow minimum space 1/16 inch between end joints and 1/8 inch at edge joints for expansion and contraction of panels.
- c. Support edge joints by use of plyclips or lumber blocking.
- d. Nail 6 inches o.c. along panel edges and 12 inches o.c. at intermediate supports.
- e. Use 6d common, smooth ring-shank, or spiral-thread nails for panels ½ inch thick or less and 8d greater thickness.
- g. Install "H" clips between each truss or rafter.

3.03 ADJUST AND CLEAN:

- A. Protect wood decking with protective waterproof covering until roofing has been installed.

END OF SECTION 06113

**SECTION 06200
FINISH CARPENTRY**

PART 1 - GENERAL

- 1.01 RELATED DOCUMENTS:
A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- 1.02 DESCRIPTION OF WORK:
A. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.
B. Types of finish carpentry work in the section include:
1. Interior and exterior running and standing trim.
- 1.03 SUBMITTALS:
A. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.
1. Interior and exterior standing and running trim.
- 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:
A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- 1.05 JOB CONDITIONS:
A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

- 2.01 WOOD PRODUCT QUALITY STANDARDS:
A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
B. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
C. Woodworking Standard: Where indicated for a specific product comply with specified provision of the following:

1. Architectural Woodwork Institute (AWI) "Quality Standards".

2.02 MATERIALS:

A. General:

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.
2. Moisture Content of Softwood Lumber: Provide seasoned (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
3. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.
4. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.

B. Interior Finish Carpentry:

1. Standing and Running Trim for Painted Finish: Any Western soft- wood or Southern Yellow Pine species graded and inspected by WWPA complying with following requirements.
 - a. Grade for Standard Sizes and Patterns: "C Select"

C. Miscellaneous Materials:

1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, material and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
- B. Pre-Installation Meeting: Meet at project site prior to delivery of finish carpentry materials and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor, Architect and Owner Representatives (If any), Installers of finish carpentry, wet work including plastering, other finishes, painting, mechanical work and electrical work, and firms and persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with finish carpentry on interior only when everyone concerned agrees that required ambient conditions can be properly maintained.

3.02 INSTALLATION:

- A. Discard units of material which are unsound, warped, bowed twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.
- E. Anchor finish carpentry work to anchorage devices or blocking built-in directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.03 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

- A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.
- B. Refer to Division-9 sections for final finishing of installed finish carpentry work.
- C. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06200

SECTION 06400 ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Laminate-clad cabinets (plastic-covered casework).
 - 2. Plastic-laminate countertops.
 - 3. Solid-surface material countertops.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work concealed in the wall.
 - 2. Division 8 Section "Wood Doors" for doors specified by reference to architectural woodwork standards.
 - 3. Division 9 Section "Painting" for field finishing of installed interior architectural woodwork.
 - 4. Division 6 Section "Finish Carpentry" for hardwood-veneered interior paneling and standing and running trim.

1.03 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.04 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.
- D. Samples of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
 - 1. Shop-applied stain finishes.
 - 2. Plastic laminates.
 - 3. Thermoset decorative overlays.
 - 4. Solid surface material.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that 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.
- B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.
- C. Single-Source Responsibility for Fabrication and Installation: Engage a qualified woodworking firm to assume undivided responsibility for fabricating, finishing, and installing woodwork specified in this Section.

- D. Quality Standard: Except as otherwise indicated, comply with the following standard:
 - 1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.
 - a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.
 - b. NOTE: Where the drawings refer to "panels" this shall mean the AWI required substrate (i.e. plywood, particle board, etc) unless specifically indicated otherwise.
- 1.06 DELIVERY, STORAGE, AND HANDLING
- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.
 - B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."
- 1.07 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
 - B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
 - 2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.
- 1.08 COORDINATION
- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD..
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Softwood Plywood: PS 1.
 - 5. Hardwood Plywood and Face Veneers: HPVA HP-1, made with an adhesive containing no area formaldehyde.
 - a. Wood species and cut: Maple, quarter sawn.
- B. Fiberboard: Medium-density fiberboard made without formaldehyde and complying with ANSI A208.2.
 - 1. Product: Subject to compliance with requirements, provide Medite II by Medite Corp.
- C. Particleboard: ANSI A208.1, Grade M-2 made with phenol-formaldehyde resins.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that the architect may incorporate in the Work include, but are not limited to, the following:
 - a. Formica Corporation (Basis of Design).
 - b. Laminart.
 - c. Nevamar Corp.
 - d. Wilsonart.
 2. All laminate products offered by the above companies, including premium products, hardwood veneers, metal laminates, etc. may be incorporated into the Work by the Architect. No up-charges will be accepted as a result of final laminate selection.
 - E. Adhesive for Bonding Plastic Laminate: As recommended by manufacturer.
 - F. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.
 1. Substrate: Medium-density particleboard.
 2. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with the material and performance requirements of ANSI Z124.3, Type 5 or Type 6, without a precoated finish. Refer to Section 10001-Miscellaneous Specialties.
 - G. Composite Solid Surface Panels: through-body material, minimum 90% composition of quartz with polymer and colorants. Selection by architect from standard manufacturer finishes for the noted grade range.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that the architect may incorporate in the Work include, but are not limited to, the following:
 - a. Ceasarstone (Basis of Design).
 - b. Corian.
 - c. Wilsonart.
 2. Adhesives and joint fillers as recommended by manufacturer.
- 2.02 CABINET HARDWARE AND ACCESSORY MATERIALS
- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
 - B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.
 - C. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
 - D. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.
- 2.03 INSTALLATION MATERIALS
- A. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.
 - B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
 - C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.
- 2.04 FABRICATION, GENERAL
- A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
 1. Grade: Custom, unless indicate otherwise.
 2. Grade: Premium for Reception Desks.
 - B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch (19 mm) thick or less: 1/16 inch (1.5 mm).
 - 2. Edges of rails and similar members more than 3/4 inch (19 mm) thick: 1/8 inch (3 mm).
 - 3. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch (1.5 mm).
 - D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at the fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved shop drawings before disassembling for shipment.
 - E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.
- 2.05 LAMINATE-CLAD CABINETS (PLASTIC-COVERED CASEWORK)
- A. Quality Standard: Comply with AWI Section 400 requirements for laminate-clad cabinets.
 - B. AWI Type of Cabinet Construction: Flush overlay.
 - C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other than Tops: GP-50, 0.050-inch (1.270-mm) nominal thickness.
 - D. Postformed Surfaces: PF-42, 0.042-inch (1.067-mm) nominal thickness.
 - E. Vertical Surfaces: GP-28, 0.028-inch (0.711-mm) nominal thickness.
 - F. Edges: PVC tape, 0.018-inch (0.460-mm) minimum thickness matching laminate in color, pattern, and finish.
 - G. Materials for Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other than Drawer Bodies: Thermoset decorative overlay.
 - 2. Drawer Sides and Backs: Thermoset decorative overlay.
 - 3. Drawer Bottoms: Hardwood plywood, shop finished.
 - H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range of available colors, patterns, and finishes.
 - I. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.
- 2.06 COUNTERTOPS
- A. Quality Standard: Comply with AWI Section 400 requirements for countertops.
 - B. Type of Top: High-pressure decorative laminate complying with the following:
 - 1. Grade: GP-50, 0.050-inch (1.270-mm) nominal thickness.
 - 2. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - a. As selected by Architect from manufacturer's full range of available colors, patterns, and finishes.
 - 3. Grain Direction: Parallel to cabinet fronts.
 - C. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- 2.07 SOLID-SURFACING-MATERIAL COUNTERTOPS
- A. Quality Standard: Comply with AWI Section 400 requirements for countertops.
 - B. Grade: Premium
 - C. Solid-Surfacing-Material Thickness: 1/2 inch

- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. Provide Architect's selections from manufacturer's full range of colors and finishes.
 - E. Fabricate tops in one piece with shop-applied backsplashes and edges, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.
 - G. Grommet holes in countertop for cables to be field located by owner and drilled and trimmed on site.
 - H. Edge profile: chamfered or eased as noted in drawings.
- 2.08 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK
- A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
 - B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation.
 - 1. Shop Finishing: To the greatest extent possible, finish architectural woodwork at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.
 - C. General: The priming and shop finishing of interior architectural woodwork required to be performed at the fabrication shop are specified in this Section. Refer to Division 9 Section "Painting and Coating" for material and application requirements.
 - D. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).
- C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where necessary. Stagger joints in adjacent and related members. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.
 - 1. Install standing and running trim with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) variation from a straight line.

- F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.
 - G. Tops: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant. Caulk perimeter of cabinet junction with wall.
 - 1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - H. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.
 - I. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.
 - 1. Install flush paneling with no more than 1/16 inch in 96-inch (1.5 mm in 2400-mm) vertical cup or bow and 1/8 inch in 96-inch (3 mm in 2400-mm) horizontal variation from a true plane.
 - J. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.
 - K. Refer to Division 9 Sections for final finishing of installed architectural woodwork.
- 3.03 ADJUSTING AND CLEANING
- A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - B. Clean, lubricate, and adjust hardware.
 - C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.
- 3.04 PROTECTION
- A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.
- 3.05 CABINET HARDWARE AND ACCESSORY SCHEDULE
- A. Available Manufacturers: Subject to compliance with project requirements, provide products by one of the following:
 - 1. Hafele
 - 2. K & V
 - 3. Accuride
 - 4. Julius Blum & Company
 - 5. Grass American
 - 6. Stanley Works
 - 7. EPCO
 - B. Hinges: Provide number of hinges recommended by hinge manufacturer for size and weight of door.
 - 1. Concealed (European Type) Hinges: for 3/4 inch-thick doors 20 inches or less in width. Grass 3000 Series, No. 3803, 120 deg. Swing, self-closing from 10 deg., Bright nickel finish.
 - 2. Butt Hinges: For 1 inch to 1-1/4-inch-thick doors and 3/4 inch-thick doors more than 20 inches in width: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
 - a. Semiconcealed for Flush Doors: BHMA A 156.9, B01361.
 - b. Semiconcealed for Overlay Doors: BHMA A 156.9, B01521.

- C. Door and Drawer Wire Pulls: EPCO; MC-402-3.5, 3-1/2 inch center to center of screws, 1 1/2-inch-projection, 5/16-inch-diameter; stainless steel.
- D. Catches: As follows:
 - 1. Push-in Magnetic Catches: B03131.
- E. Adjustable Shelf Standards:
 - 1. Multiple Holes (5 mm dia. with pins).
- F. Drawer Slides:
 - 1. Material Quality Standard: BHMA A156.9, B05091, Grade (load rating) as indicated.
 - 2. Description: Side or rail mounted, travel as indicated, progressive movement, zinc-plated steel slides with all steel ball bearings.
 - 3. Box Drawers Product Standards:
 - a. 24 Inches Wide and Less: Grade 1HD-100, full extension; Accuride "7434".
 - b. Wider than 24 inches: Grade 1HD-100, full extension; Accuride "7432".
 - 4. File Drawers Product Standard: 42 inches wide and less, Grade 1HD-200, full extension with one inch over travel; Accuride "3640"
 - 5. Pencil Drawers Product Standard: 16 inches wide and less, low profile, 75 pound load rating (at 2/3 travel), full extension; Accuride "2632".
- G. Door and Drawer Locks: K & V No. 986 or 987, nickel plated.
- H. Cable Cover Grommets: Hafele; 429.93; color as selected by Architect.

END OF SECTION

SECTION 06402 INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" by AWI.
- B. WIC Quality Standard: Comply with applicable requirements of "Manual of Millwork" by WIC.
- C. WIC Quality Marking: Mark each unit of the following types of architectural woodwork with WIC Certified Compliance Label indicating quality grade required.
- D. Shop Drawings: Submit shop drawings for each item of architectural woodwork.
Samples: Submit finished samples of each wood species and cut indicated for transparent finish; of each material indicated for opaque finish; of each color, pattern, and finish of plastic laminate; and of each type of cabinet hardware.

1.02 PRODUCTS

- A. Interior Wood: Materials as follows:
 - 1. Lumber Species for Opaque Finish: Any closed-grain hardwood listed in referenced woodworking standard.
- B. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
 - 1. Hardwood Plywood: HPMA FE.
- C. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
- D. Wood Cabinets for Opaque Finish: As follows:
 - 1. Grade: Custom.
 - 2. AWI Type of Cabinet Construction: Flush overlay.
- F. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 section "Finish Hardware."
 - 1. Cabinet Hardware Schedule: Refer to schedule at end of this section for cabinet hardware required for architectural cabinets.
 - 2. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.
 - 3. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for BHMA code number indicated.
Satin Chromium Plated,: BHMA 626.
 - 4. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of ANSI/BHMA A156.9.
- H. Architectural Cabinet Tops: As follows:
 - 1. Plastic laminate on $\frac{3}{4}$ " plywood.
 - a. Grade: Custom.
- I. Finishes for Architectural Woodwork: Finish architectural woodwork as follows.
 - 1. Provide factory finish system of type indicated for the following types of architectural woodwork.
 - a. Cabinets.

1.03 EXECUTION

- A. Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.
- B. Tops: Anchor securely to base units.

END OF SECTION 06402

SECTION 07115 SHEET WATERPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 SUMMARY:

- A. Extent of each type of sheet waterproofing work is indicated on drawings.
- B. Types of sheet waterproofing specified in this section include the following:
 - 1. EPDM sheet waterproof membranes.
 - 2. PVC sheet waterproof membranes.

1.03 SYSTEM PERFORMANCE:

- A. Provide sheet waterproofing products which have been produced and installed to establish and maintain watertight continuous seals.

1.04 SUBMITTALS:

- A. Product Data: Submit product data and general recommendations from waterproofing materials manufacturer, for types of waterproofing required. Include data substantiating that materials comply with requirements.

1.05 QUALITY ASSURANCE:

- A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm with not less than 3 years of successful experience in installation of waterproofing similar to requirements for this project and which is acceptable to manufacturer of primary waterproofing materials.

1.06 PROJECT CONDITIONS:

- A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed.
- B. Weather: Proceed with waterproofing and associated work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.07 SPECIAL PROJECT WARRANTY:

- A. Provide written warranty, agreeing to replace/repair defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work which conceals sheet waterproofing.
 - 1. Warranty period is 5 years after date of substantial completion.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. General: Provide sheet waterproofing materials complying with required performance. Other similar materials certified in writing to be equal-to-or-better than specified may be used if acceptable to Architect.

2.02 EPDM SHEET WATERPROOFING:

- A. Ethylene propylene diene monomers formed into uniform flexible sheets of thickness shown, or if no thickness is shown, not less than 1/16" thick, complying with the following:
 1. Hardness: 50 to 70 Shore A; ASTM D 2240.
 2. Tensile Strength: 1400 psi; ASTM D 412.
 3. Ultimate Elongation: 300 percent; ASTM D 412.
 4. Brittleness Temperature: -75 deg F (-59 deg C); ASTM D 746.
 5. Tear Resistance: 125 lbs. per lin. inch; ASTM D 624 (Die C).
 6. Resistance to Heat Aging: Maximum hardness increase of 15 points, maximum reduction in elongation of 30 percent and maximum loss of tensile strength of 15 percent (168 hrs. at 240 deg F, 116 deg C); ASTM D 573.
 7. Resistance to Ozone Aging: No cracks after 168 hours exposure of 50 percent elongated sample at 104 deg F (40 deg C) and 100 pphm ozone; ASTM D 1149.
 8. Resistance to Water Absorption: Less than 0.5 percent volume gain for 72 hours immersion at 212 deg F (100 deg C); ASTM D 471.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. Hydro-Seal EPDM; American Hydrotec, Inc.
 2. Sure-Seal EPDM; Carlisle Syntec Systems.
 3. Plastisheet EPDM; Progress Unlimited, Inc.
 4. E-25 EPDM; Gates Engineering Co.

2.03 PVC SHEET WATERPROOFING:

- A. Virgin polyvinyl chloride with plasticizers and other modifiers, formed into uniform flexible sheets of thickness shown or, if no thickness is shown, not less than 56 mils thick, complying with the following:
 1. Hardness: 60 to 80 Shore A; ASTM D 2240.
 2. Tensile Strength: 2000 psi; ASTM D 412.
 3. Ultimate Elongation: 250 percent; ASTM D 412.
 4. Brittleness Temperature: -20 deg F (-29 deg C); ASTM D 746.
 5. Tear Resistance: 125 lbs. per lin. inch; ASTM D 624 (Die C).
 6. Resistance to Heat Aging: Maximum hardness increase of 15 points, maximum reduction in elongation of 25 percent, and maximum loss of tensile strength of 20 percent (168 hrs. at 200 deg F, 93 deg C); ASTM D 573.
 7. Resistance to Ozone Aging: No cracks after 5,000 hours exposure of 20 percent elongated sample at 104 deg F (40 deg C) and 50 pphm ozone; ASTM D 1149.
 8. Resistance to Water Absorption: Less than 0.5 percent weight gain for 48 hours of immersion at 212 deg F (100 deg C); ASTM D 570.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. PVC Vi-Seal; AFCO Products Inc.
 2. BFG Water Barrier; B. F. Goodrich Co.
 3. Plastisheet PVC; Progress Unlimited, Inc.

4. Vinylseal; Sonneborn Building Products.

2.04 AUXILIARY MATERIALS:

- A. Adhesives: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproof sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.
- B. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.
- C. Coatings: Provide type of coating recommended by waterproofing sheet manufacturer, for improvement of weathering resistance on exposed areas of membrane, including areas extended as flashing (if any). Provide black coating except as otherwise indicated.
- D. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material for flashing as recommended by waterproofing sheet manufacturer.
- E. Protection Course: Where shown, provide type recommended by waterproofing sheet manufacturer, unless another type is indicated; include adhesives recommended by manufacturer.
- F. Paper Slip Sheet: 5-lb. rosin-sized building paper.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. General: Comply with manufacturers instructions for surface preparation.
- B. Prior to installation of waterproofing and associated work, meet at project site with Installer of each component of associated work, inspection and testing agency representatives (if any), and installers of work requiring coordination with waterproofing work. Review material selections and procedures to be followed in performing work.
- C. On wood decks, apply course of paper slip sheet, unless omission is recommended by waterproofing materials manufacturer for specific application shown.
- D. On concrete decks, immediately before placement of waterproofing sheet, grind or abrasive blast surface lightly to ensure removal of projections which might penetrate sheet or curing compounds which would interfere with fully bonded systems. Clean deck of loose material by brooming and vacuuming.
- E. On vertical foundation walls chip off projections where necessary for proper placement and adhesion of waterproofing sheet.
- F. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area which will be covered by WP membrane in same working day; re-prime areas not covered by WP membrane within 24 hours.
- G. Do not advance laying of insulation ahead of waterproofing more than necessary for sequence of operation. Cover insulation exposed at end of day's work (and when rain threatens) with waterproofing materials. Remove and dispose of insulation which has become wet; replace before proceeding with insulating and waterproofing work.

3.02 INSTALLATION:

- A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.

- B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.
- C. Extend waterproofing sheet and flashings as shown to provide complete membrane over area indicated to be waterproofed. Seal to projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommended by manufacturer, bond to horizontal surfaces.
- D. Top Edge Seal: For vertical and sloped wall membrane, finish in reglet (where provided), otherwise finish under flashing or under masonry in joint. Caulk exposed edges with mastic or sealant.
- E. Expansion Joints: Install joint filler as recommended by manufacturer, with protruding rounded surface. Apply continuous 8" wide strip of membrane on joint followed by membrane application.
- F. Coat exposed areas of sheet and flashing materials. Comply with sheet manufacturer's recommendations for application and cure of coating.
- G. Install protection course of type indicated over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

3.03 PERFORMANCE REQUIREMENTS:

- A. It is required that waterproof membranes are watertight and not deteriorate in excess of limitations published by manufacturer.
- B. In-place Testing: Before completed membranes on horizontal surfaces are covered by protection course or other work, test for leaks with 2" depth of water maintained for 24 hours. Repair any leaks revealed by examination of substructure and repeat test until no leakage is observed.

3.04 CLEANING:

- A. After completion, remove any masking materials and stains from exposed surfaces caused by waterproofing installation.

3.05 PROTECTION:

- A. Institute required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

END OF SECTION 07115

**SECTION 07175
WATER REPELLENTS**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of surfaces to receive water repellent is indicated on drawings and by provisions of this section.
- B. Following applications of water repellent are required, but excluding associated areas of floors, stairs and pavings:
 - 1. Exterior unit masonry surfaces.
 - 2. Interior (unglazed) unit masonry surfaces.

1.3 QUALITY ASSURANCE:

- A. Application: A firm with not less than 3 years of successful experience in application of water repellents of types required on substrates similar to those of this project.
- B. Project Mock-Up: Apply water repellent to mock-up, either partial or full coverage as directed, before proceeding with installation. Comply with installation requirements of this section.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for water repellents. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.
- B. Samples: Submit 16" square samples of each substrate indicated to receive liquid water repellent, with repellent treatment as specified applied to half of each sample.

1.5 JOB CONDITIONS:

- A. Weather and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer), when ambient temperature is less than 50 deg.F (10 deg.C); when substrate surfaces have cured for less than a period of 2 months; when rain or temperatures below 40 deg.F (4 deg.C), are predicted for a period of 24 hours, or earlier than 3 days after surfaces became wet; when substrate is frozen; at surface temperature of less than 40 deg.F (4 deg.C).

PART 2 – PRODUCTS

2.1 SOLVENT-BASED SILICONE SEALER:

- A. Provide a 5.0% concentration of polymerized silicone resins in hydrocarbon solvents, complying with FS SS-W-110.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following (or approved equal):
 - 1. Rexnord Chemical Products; Sonneborn Building Products
 - 2. Thoro System Products
 - 3. W.R. Meadows

2.2 SOLVENT-BASED ACRYLIC SEALER:

- A. Provide manufacturer's standard "water-clear" breathing coating of acrylic resins (based on methyl methacrylate) in volatile hydrocarbon solvents, and including other resins and additives as recommended by manufacturer for specific project substrates.
- B. Provide light compound, 4.0 to 7.5% solids content.

- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
1. Applied Polymers of America, Inc.
 2. Anti-Hydro Waterproofing Co.
 3. Toch/Carboline Co.
 4. Chemprobe Corp.
 5. L & M Chemical Co.
 6. Pecora International Corp.
 7. ProSoCo, Inc.
 8. Rexnord Chemical Products; Sonneborn Building Products
 9. Rexnord Chemical Products; Sonneborn Building Products
 10. VIP Enterprises, Inc.
 11. W.R. Meadows

2.3 WATER-BASED ACRYLIC SEALER:

- A. Provide manufacturer's standard "water-clear" emulsion-type breathing coating of acrylic resins (based on methyl methacrylate) in water recommended by manufacturer for application to interior and exterior concrete and masonry surfaces as a water-repellent coating; averaging 15% to 22% solids content.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- C. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
1. Applied Polymers of America, Inc.
 2. OKON, Inc.
 3. Seal-Krete, Inc.
 4. VIP Enterprises

2.4 CONTRACTOR OPTIONS (PROPRIETARY):

- A. General: At Contractor's option, provide one of the following products in lieu of generic types of liquid water repellent specified in this section, and include manufacturer's certification to effect that product complies with or exceeds required performances as indicated for generic types:
1. Clear Double 7; Hydrozo Coatings Co.
 2. Chem-Trete BSM; Dynamit Nobel of America, Inc.
 3. Sure-Klean Weather Seal 224; ProSoCo, Inc.
 4. Rainstopper Clear; Textured Coatings of America, Inc.
 5. Prim-a-pell 200; Chemprobe Corp.

PART 3 - EXECUTION

3.1 PREPARATION:

- A. Test Application: Prior to performance of water repellent work, including bulk purchase/delivery of products, prepare a small application in an unobtrusive location and in a manner acceptable to Architect, for purpose of demonstrating final effect (visual and physical/chemical) of planned installation. Proceed with work only after Architect's acceptance of test application, or as otherwise directed.
1. Revision of planned installation, if any and as requested by Architect, will be by change order where it constitutes a departure from requirements of contract documents at time of contracting.
- B. Clean substrate of substances which might interfere with penetration/adhesion of water repellents. Test for moisture content, in accordance with repellent manufacturer's instructions, to ensure that surface is sufficiently dry.
- C. Coordination with Sealants: Where feasible, delay application of water repellents until installation of sealants has been completed in joints adjoining surfaces to be coated with repellent.
- D. Protect adjoining work, including sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass where there is possibility of water

repellent being deposited on surfaces. Cover live plant materials with drop cloths. Clean water repellent from adjoining surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

3.2 INSTALLATION:

- A. Apply a heavy saturation spray coating of water repellent on surfaces indicated for treatment using low pressure spray equipment. Comply with manufacturer's instructions and recommendations, using airless spraying procedure unless otherwise indicated.
 - 1. Precast Work: At Contractor's option, first application of water repellent on precast concrete units may be completed prior to installation of units. Mask sealant-bond surfaces to prevent migration of water repellent onto joint surfaces.
- B. Apply a second saturation spray coating, repeating first application. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if printed recommendations are not applicable to project conditions.

END OF SECTION 07175

**SECTION 07200
INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of insulation work is shown on drawings, by generic names or by abbreviations.
- B. Applications of insulation specified in this section include the following:
 - 1. Blanket-type building insulation.
 - 2. Perimeter slab insulation.

1.3 QUALITY ASSURANCE

- A. Thermal Conductivity: Thicknesses shown are for thermal conductivity (k-value at 75 degrees F. or 24 degrees C.) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide appropriate thickness.
- B. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with governing regulations as interpreted by authorities.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of insulation required.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

1.5 PRODUCT HANDLING

- A. General Protection: Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following: (or approved equal):
 - 1. Manufacturers of Extruded Polystyrene Board Insulation:
 - a. Amoco Foam Products Co.
 - b. Dow Chemical U.S.A.
 - c. Minnesota Diversified Products, Inc.
 - d. UC Industries.
 - 2. Manufacturers of Glass Fiber Insulation:
 - a. CertainTeed Corp.
 - b. Knauf Fiber Glass GmbH.
 - c. Manville Corp.
 - d. Owens-Corning Fiberglass Corp.

2.2 INSULATING MATERIALS:

- A. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics.

1. Performed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.
- B. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for Type indicated; with 5-year aged R-values of 5.4 and 5 at 75 deg.F (4.4 and 23.9 deg. C), respectively; and as follows:
 1. Type IV, 1.6 lb./cu. ft. min. density, unless otherwise indicated.
- C. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less); foil-scrim-kraft vapor-retarder membrane on one face, respectively; and as follows:

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION:

- A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.
- B. Clean substrates of substances harmful to insulation or vapor retarders, including removal of projections which might puncture vapor retarders.

3.2 INSTALLATION, GENERAL:

- A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION:

- A. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of insulation.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION:

- A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support units.
- B. Seal joints between closed-cell (non-breathing) insulation units by applying mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.
- C. Set vapor retarder faced units with vapor retarder to warm side of construction, except as otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
- D. Set reflective foil-faced units accurately with air space in front of foil as shown. Provide not less than 0.75" air space where possible.
- E. Place loose glass fiber insulation into spaces and onto surfaces as shown, either by pouring or by machine-blowing. Level horizontal applications to uniform thickness as indicated, lightly settled to uniform density, but not excessively compacted.

3.5 PROTECTION

- A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation or concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION 07200

SECTION 07270 FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Section includes materials for complete firestop installation of penetrations consisting of pipe, duct, cable, other electrical devices, or blank openings in fire treated walls, floors, and partitions.

1.3 REFERENCES

- A. Standards of the following referenced:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. Environmental Protection Agency (EPA).
 - 3. Factory Mutual (FM).
 - 4. Underwriters' Laboratories, Inc. (UL).
 - 5. Warnock Hersey (WH).
- B. Industry standards:
 - 1. ASTM E814-83 (1991): Standard Method of Fire Tests of Through-Penetration Firestops.
 - 2. FM: Approval Guide, 1993 edition.
 - 3. UL 1479: Fire Tests of Through-Penetration Firestops, 1993 edition.
 - 4. UL Fire Resistance Directory: Through-Penetration Firestop Devices (XHCR) and Through Penetration Firestop Systems (XHEZ), 1993 edition.
 - 5. WH: Certification Listings, 1993 edition.

1.4 DEFINITIONS

- A. Terms:
 - 1. Alpha - Alpha- Numeric system for penetration identification: UL 1993 system to universally identify and categorize penetrations.
 - a. First alpha grouping: Designates penetration type; "F" for floors, "W" for walls, "C" for either or both floors and walls.
 - b. Second alpha grouping: Further designates significant assembly characteristics; "A" for concrete floors with minimum thickness less than or equal to 5", "J" for concrete or masonry walls with minimum thickness less than or equal to 8".
 - c. Numeric grouping: Designates penetrating item; 1000-1999 for metal pipe, conduit, or tubing, 5000-5999 for insulated pipes.
 - d. Example; assembly F-A-5001 means Floor penetration - Concrete substrate less than or equal to 5" - Insulated pipes.
 - 2. Fire rated: Having ability to withstand effects of fire for specified time period, as determined by qualified testing.
 - 3. Fire rated assembly: Floor, wall, or other partition also to withstand design fire and hose stream test without failure.
 - 4. Fire resistance rating: Time, in hours, for which rated assembly can withstand effects of fire without burn-through or structural failure.
 - 5. Firestop: Means of sealing openings in fire rated assemblies to preserve or restore fire resistance rating.
 - 6. Firestop system: Combination of materials or devices, including penetrating items, required to make up complete firestop.
 - 7. Intumescent: Having the quality to enlarge, swell, or expand with heat.
 - 8. Penetrating item: Pipe duct, conduit, cable tray, cable, or other element passing through opening in fire rated assembly.

9. VOC: Volatile organic compounds.

1.5 SYSTEM DESCRIPTION

A. Design requirements:

1. Designs selected for installation: Provide fire resistance rating at least equal to hourly resistance rating of floor, wall, or partition into which firestop design is installed.
2. Firestop systems and materials:
 - a. Not require special tools for installation.
 - b. Do not emit hazardous, combustible, or irritating fumes during installation, curing, or use.
3. When more than one firestop design is applicable, evaluate individual product characteristics for secondary benefits in performance, e.g. environmental/water sealing or ease of installation or modification.

B. Performance requirements:

1. Fire and hose stream on material: Meet requirements of ASTM E814-83 for F (Flame) Rating or T (Temperature) Rating required by local code.
2. Fire tests, ASTM E11983: Pass requirements when used in assembly.
3. Smoke and fuel contributed tests on firestopping materials. ASTM E84-87: Flame Spread 25 or less, Smoke Developed 20.
4. Firestop systems do not re-establish the structural integrity of load bearing partitions. Consult Architect prior to drilling or coring operations in any load bearing assembly.
5. Firestop systems are not intended to support live loads or traffic. Curbs or steel plates may be required to restrict or accommodate potential traffic. Notify Architect, in writing, if these limitations may be violated.

1.6 SUBMITTALS

A. Product data:

1. Complete list of products for use; indicate compliance with VOC limits.
2. Data for fire or smoke rated insulation; indicate complete installation instructions for maintaining ratings of wall or floor assemblies to meet code requirements.
3. "Manufacturer's Safety Data Sheets", (M.S.D.S.), for materials.

B. Shop drawings: Complete schedule of rated penetrations, locations, and proposed rated materials to fill penetrations in accord with UL Alpha-Alpha-Numeric system.

C. Quality control submittals:

1. Certificates:
 - a. Indicate materials supplied or installed are asbestos free.
 - b. Indicate compliance with applicable VOC limits.
2. Test reports: Products supplied: indicate recognized laboratory test results for same type conditions encountered on Project.
3. Manufacturer's instructions:
 - a. Exact procedures for installation of rated firestop material to maintain wall, floor, or combination assemblies ratings: indicate penetration hole/pipe size relationship, if required, for clearances to obtain results same as tested assemblies.
 - b. Disposal requirements for expended material or partially expended containers.

D. Contract closeout submittals:

1. Project record documents: Completion and inspection reports in FIELD QUALITY CONTROL Article.

1.7 QUALITY ASSURANCE

- A. Qualifications, installer: Use only one installer for all firestopping work.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection: Dispose expended or partially expended material containers in accord with EPA requirements.

1.9 SEQUENCING AND SCHEDULING

- A. Additional firestopping requirements may be created by construction activities specified in other sections.
 - 1. Identify locations requiring firestopping.
 - 2. Schedule and coordinate firestopping installation after completion of duct, piping, electrical runs, and prior to covering or concealing openings or eliminating access.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General:
 - 1. Products of manufacturers indicated below may be used singly or in combination to meet ratings of adjacent wall, floor, or perimeter.
 - 2. Using product or products singly or in combination requires recognized testing laboratory test results for indicated application; system selection is optional unless testing requires use of one particular type.
 - 3. Intent is to maintain rated integrity of wall, floor, or ceiling at penetrations.
 - 4. No ampacity de-rating of cable at penetrations.
 - 5. Reviewed schedule indicates insulation type or types and locations used.
 - 6. Penetrations, smoke and fire fall into two categories:
 - a. Not requiring Intumescent qualities.
 - b. Requiring Intumescent qualities, such as PVC pipe or other dissolving materials.
- B. Acceptable manufactures:
 - 1. Putty, mortar, re-entry type, and metal collar/cuff assemblies:
 - a. Dow Corning Company.
 - b. Fipro TM Corp. Of America.
 - c. Flames Stop, Inc.
 - d. General Electric Company.
 - e. Hevi-Duty/Nelson.
 - f. Hilti, Inc.
 - g. Retorseal, Inc.
 - h. Specified Technologies, Inc.
 - i. 3M Company/Electrical Products Division.
 - 2. Safing insulation:
 - a. Acceptable products:
 - 1) Fibrex: FBX Safing Insulation.
 - 2) Partek Insulation; Paroc Safing Insulation.
 - 3) USG Acoustical Products Company; Thermafiber Safing Insulation.
 - b. Characteristics:
 - 1) Composition: ASTM C612-83, Class 3, semi-rigid to rigid mineral fiber boards.
 - 2) Density: Four PCF, nominal.
 - 3) Thickness: Required for penetration rating.
 - 4) Combustibility, ASTM E136-82: Noncombustible.
 - 5) Flame spread, ASTM E84-87: 15, maximum.
 - c. Accessories: USG Acoustical Products Company 12 gauge Snap-on Clip Type A or Prong Clip Type D standard impaling clips or similar clips of other manufacturers code approved for use.
 - 3. Accessories:
 - a. Furnish damming materials and other materials for installation.
 - b. Permanent labels to identify penetration with space for name of installing company, date installed, and UL or WH penetration designation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Verify that penetrating elements and supporting devices have been installed and temporary lines have been removed.

3.2 PREPARATION

- A. Clean surfaces in contact with penetration seal materials of dust, dirt, grease, oil, loose materials, rust and other substances.

3.3 INSTALLATION

A. General

1. Install firestopping materials in accord with tested configurations; system selection is optional unless testing requires use of one particular type.
2. Locations, general:
 - a. Cavities of floor-to-floor penetrations; include spaces around conduit, cable, piping and duct penetrations.
 - b. Rated wall penetrations: include spaces around conduit, cable, electrical boxes, piping, and duct penetrations.
 - c. Vertical service shaft penetrations.
 - d. Openings where fire rated walls terminate at metal floor or roof deck.
 - e. Other locations indicated.
3. Follow manufacturer's recommendations to obtain a smooth, professional finish.
4. Remove forms or damming materials, if used, after designated cure time unless support materials used are fire resistant or noncombustible nature.
5. Reviewed submittal schedule indicated type or types firestopping used and actual locations.

- B. Install permanent labels at each penetration, in conspicuous location on pipe, duct, or other hard surface, indicating assembly configuration installed, date installed, and installing company.

3.4 FIELD QUALITY CONTROL

A. Inspection:

1. Examine penetration seals for correct installation, adhesion, and curing appropriate for respective seal materials.
2. Keep areas of firestopping work accessible; notify code authorities or designated inspectors, in writing, of work released for inspection.
3. Document completion and inspection; file completion and inspection reports with Project closeout documents.

3.5 ADJUSTING

A. Repairs and modifications:

1. Identify damaged or re-entered seals requiring repair or modification.
2. Remove loose or damaged materials.
3. If penetrating elements are to be added, remove enough material to insert new elements being careful not to cause damage to balance of seal.
4. Ensure surfaces to be sealed are clean and dry.
5. Install materials in accord with materials approved by manufacturer as suitable for repair of original seal.

END OF SECTION 07270

**SECTION 07311
ASPHALT SHINGLES**

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 asphalt shingles for roofs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 6 Section "Rough Carpentry" for wood sheathing and framing.
 - 2. Division 7 Section "Flashing and Sheet Metal" for metal valley flashing, step flashing, drip edges, and other sheet metal work.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.
- C. Samples for initial selections in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.
- D. Samples for verification in the form of 2 full-size units of each type of asphalt shingle indicated showing the full range of variations expected in these characteristics.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.
- B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

1.6 WARRANTY

- A. General Warranty: The special 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. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of asphalt shingles beyond normal weathering.
 - 1. Warranty Period: Manufacturer's standard but not less than 30 years after date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Furnish 1 square coverage for each color of asphalt shingles, identical to those to be installed, in unbroken bundles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide asphalt shingles produced by one of the following (or approved equal):
 - 1. Atlas Roofing Corp.
 - 2. CertainTeed Corporation.
 - 3. GAF Building Materials Corporation.
 - 4. Owens-Corning Fiberglas Corp.
 - 5. Tamko Asphalt Products, Inc.
- B. Available Products: Subject to compliance with requirements, products that to be incorporated in the Work include the following (or approved equal):
 - 1. Nail Over Ridge Vents:
 - a. Ridge Filter Shinglevent; Air Vent, Inc.
 - b. Cobra Ridge Vent; GAF Building Materials Corporation.
 - c. Roll Vent; Obdyke: Benjamin Obdyke, Inc.
 - d. Ventsure rigid roll: Owens-Corning Fiberglas Corp.

2.2 ASPHALT SHINGLES

- A. Colors, Blends, and Patterns: Where manufacturer's standard products are indicated, provide asphalt shingles with the following requirements:
 - 1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for asphalt shingles of type indicated. Four colors shall be selected for use.
- B. Dimensional /30 Shake FRS, class A rating. Fiberglass, Laminated Strip Shingles: Mineral-surfaced, self-sealing, laminated, multi-ply overlay construction, fiberglass-based, strip asphalt shingles, complying with both ASTM D 3018, Type I, and ASTM D 3462. FRS.
- C. Ridge Shingles: Manufacturer's standard, factory-precut units to match asphalt shingles.

2.3 METAL TRIM AND FLASHING

- A. Sheet Metal Materials: Furnish the following sheet metal materials:
 - 1. Prefinished aluminum Sheets: ASTM B 209, alloy 3003 H14, minimum 0.024 inch thick, unless otherwise indicated.
- B. Metal Drip Edge: Brake-formed sheet metal with at least a 3-inch roof deck flange and a 1-1/2-inch fascia flange with a 3/8-inch drip at lower edge. Furnish the following material in lengths of 10 feet.
 - 1. Material: Prefinished aluminum sheets. The finish shall be a two-coat acrylic in a two-phase operation that includes corrosion-inhibiting primer and a baked-on, high-performance acrylic topcoat.
- C. Metal Flashing: Job-cut to sizes and configurations required.
 - 1. Material: Prefinished aluminum sheets. The finish shall be a two-coat acrylic in a two-phase operation that includes corrosion-inhibiting primer and a baked-on, high-performance acrylic topcoat.
- D. Vent Pipe Flashing: Lead conforming to ASTM B 749, Type L51121, at least 1/16 inch thick, unless otherwise indicated. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof extending at least 4 inches from pipe onto roof.

2.4 ACCESSORIES

- A. Underlayment: Synthetic, 1-layer, complying with ASTM D 226, Type II or ASTM D 2626. (Tri-Built – Professional Grade (or approved equal)).
- B. Closed Valley Underlayment: Ice and Water Barrier, 1 layer, 36" wide, full length of closed valleys. (GAF Weatherlock (or approved equal)).
- C. Ridge Vent: High-density polypropylene, nonwoven modified polyester, or other UV-stabilized plastic designed to be installed under asphalt shingles at ridge.
- D. Nails: Aluminum or hot-dip galvanized steel, 0.120-inch- diameter barbed shank, sharp-pointed,

conventional roofing nails with a minimum 3/8-inch- diameter head and of sufficient length to penetrate 3/4 inch into solid decking or at least 1/4 inch through sheathing.

1. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Contractor is responsible for verifying condition of roof decking.
- B. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.
- C. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
 1. Fasten asphalt shingles to roof sheathing with nails.
- B. Synthetic Underlayment: Apply 1 layer of underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 4 inches, end laps a minimum of 6 inches, and hips and valleys a minimum of 6 inches. Fasten with sufficient number of roofing nails to hold underlayment in place until asphalt shingle installation.
- C. Underlayment at Closed Valleys: Center a 36-inch- wide ice and water barrier in valley and secure with only enough nails to hold in place until asphalt shingles are installed. Lap roof underlayment over entire valley underlayment.
- D. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."
- E. Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
 1. Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.
 2. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.
- F. Ridge Vents: Install ridge vents according to manufacturer's instructions.

3.4 ADJUSTING

- A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION 07311

**PANELIZED STONE VENEER
07420**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Panelized stone veneer wall cladding for exterior applications.

1.2 RELATED SECTIONS

- A. Section 06 11 00 – Wood Framing: Framing design compliance with panelized stone veneer structural requirements for supporting wall construction.

1.3 SUBMITTALS

- A. Product Data: Submit data on product characteristics and general installation information.
- B. Shop Drawings: Submit shop drawings indicating layout and elevations indicating coursing, trim, flashing and terminations with adjacent materials.
- C. Verification Samples: Submit for each finish product specified, two samples, minimum size 8 inches square, representing actual product.
- D. Evaluation Reports: Submit copy of ICC-ES Evaluation Service Report
- E. Recycled Content Documentation: Submit copy of UL Environment report.
- F. Green Approved Product: Submit copy of NAHB Research Center certificate.
- G. Warranty: Submit copy of manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

- A. Green Approved Product: Certificate for National Green Building Certification, issued by NAHB Research Center.
- B. Recycled Content: Minimum 50 percent recycled content in panelized stone veneer as validated by UL Environment.
- C. Testing Agency: Provide certificate/s showing testing performed by all testing agencies that have demonstrated compliance with ANSI/ISO/IEC Standard 17025 and is accredited as a Testing Laboratory (TL-144) by International Accreditation Service, Inc.
- D. Mock-Up: Provide a mock-up for evaluation of substrate preparation, detailing trim, and application workmanship.
 - 1. Locate mock-up in area designated by Architect.
 - 2. Do not proceed with remaining work mock-up is accepted by Architect.
 - 3. Modify mock-up if required until accepted by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Transport and store in original shipping packaging until ready to use. When sub-packs are removed, transport and store with nailing flange up.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's limits.

1.7 WARRANTY

- A. Warranty: Provide manufacturer's standard warranty against defects in manufacturing.

PART 2 - PRODUCTS

2.1 PANELIZED STONE VENEER

- A. Manufacturer: Versetta™ Stone as manufactured by Boral Stone Products LLC (or approved equal)
 - 1. Style: Tight-Cut.
 - 2. Color: Sterling.
 - 3. Color: Terra Rosa.
- B. Description: Glass-fiber-reinforced concrete (GFRC) molded stone-shaped veneer panels that interlock with a tongue and groove system, with embedded nailing strip for attaching to framing and exterior sheathing.
 - 1. Manufactured Size: 8 inches high by 36 inches wide with a thickness ranging from 1 to 2.02 inches off the wall.
 - 2. Fabricated Shapes: Universal corners, flat panel units, trimstone, wainscot cap, light boxes, and receptacle boxes.
 - 3. Water Resistant Barrier: Minimum No.15 Grade D felt building paper meeting ASTM D 226 or material meeting the requirements of ICC Acceptance Criteria #38 or ASTM E 2556.
 - 4. Nailing Strip: 26 gage steel with G90 galvanizing and factory-applied black paint.
 - 5. Channels: Manufacturer's standard vinyl starter strip and J channels.
 - 6. Fasteners: Corrosion-resistant galvanized roofing nails or screws with minimum 5/16 inch head diameter and 1/8 inch shank diameter, with length suitable to penetrate framing material minimum 1 inch. Electro galvanized fasteners are acceptable but may exhibit premature corrosion.
 - 7. Flashing and Lath as Applicable: Non-painted, non-corrosive flashing and 2.5 lb./yard2 expanded metal lath.
 - 8. Adhesive: Manufacturer's recommended PL Premium Construction Adhesive.
 - 9. Concealing Material: Colored sanded caulk at nail/screw heads and as applicable.
- C. Performance Criteria:
 - 1. Physical Properties, ICC-ES AC 90 - Section 3.1.
 - a. Dimensions and Tolerances: Within manufacturer's specifications.
 - b. Flexural Strength: Greater than 700 psi.
 - c. Density: 1218 kg/m3.
 - 2. Weather-Resistive Properties, ICC-ES AC 90 - Section 3.2.
 - a. Moisture Movement, ASTM C 1185: Average linear change in moisture content 0.06 percent
 - b. Water Absorption, ASTM C 1185: Less than 19 percent.
 - c. Moisture Content, ASTM C 1185: Less than 10 percent.
 - d. Water Tightness, ASTM C1185: No water droplets present.
 - e. Heat/Rain Exposure, ASTM C 1185: No damage or structural alternations.
 - f. Bond Strength: Tensile strength greater than 45 lb/inch.
 - 3. Transverse Loads, ICC-ES AC 90 - Section 3.3: Average sustained negative load of 135 psf, average ultimate negative load of 140 psf.
 - 4. Accelerated Weathering, ICC-ES AC 90 – Section 3.7: Complies with Section 5.1 of ASTM C 1186.
 - 5. Surface Burning Characteristics, ICC-ES AC 235 - Section 4.2.3:
 - a. Flame Spread Index = 0.
 - b. Smoke Density Index = 0.
 - c. ASTM E 84, Class A.
 - 6. Water Drainage Efficiency, ICC-ES AC 235 - Section 4.5: Greater than 90 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory conditions before proceeding.
- B. Verify compliance of existing conditions with manufacturer's requirements including the following:

1. Wood framing studs are spaced 16 inches on center or closer, designed to limit out-of-plane wall deflection to a minimum of L/240.
2. Sheathing is code approved and nailable, minimum 7/16 inch oriented strandboard or 1/2 inch exterior grade plywood.
3. Substrate is plumb within 1/4 inch in 10 lineal feet.
4. Building corners have been sheathed to meet code requirements and mitigate the effects of wall racking.
5. Expansion joints, if any, have been installed.
6. Roofing and interior wallboard have been installed.
7. Height for panelized stone veneer will not exceed 30 feet.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. Water Resistive Barrier Application: Cover sheathing with a minimum of one layer of water resistive barrier, following the installation instructions provided by the manufacturer and local building code requirements. Wrap minimum 16 inches past all inside and outside corners. Integrate with flashing, panel channels and trim.
- B. Starter Strip: Install starter strip level at the base starting point line. Fasten every 8 to 10 inches.
- C. J Channel where specified: Install J channel at windows, doors, material transitions, penetrations and terminations. Fasten every 8 to 10 inches.
- D. Drainage: Provide a means for drainage and ventilation at all horizontal terminations by using starter strip and J channel in conjunction with flashing products.
- E. Installation: Comply with manufacturer's installation instructions including the following
 1. Each full flat panel or Universal Corner panel requires a minimum of 4 fasteners. A minimum of 2 fasteners per panel shall penetrate framing.
 2. Attach products without nail flanges using adhesive. Non-painted, clean metal flashing or expanded metal lath, fastened 16 inches on center into framing is required for an acceptable bonding surface. After bonding surface has been prepared, apply minimum 3/8 inch beads of adhesive, in vertical beads, every 2 to 3 inches. Install partial panel and press into adhesive to assure complete contact. Secure until adhesive has cured.
 3. Install trim pieces and sills, as indicated.
 4. Install electrical/fixtures. Stones as indicated.
 5. Conceal fasteners or unsightly gaps as needed.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Follow adhesive manufacturers instructions and temperature limitations.

END OF SECTION

SECTION 07462 SIDING & TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiber cement lap siding, panels, shingle, trim, fascia, moulding and accessories; James Hardie HZ10 Engineered for Climate Siding.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: Sheathing.
- B. Section 07210 - Insulation: Exterior wall insulation.

1.3 REFERENCES

- A. AS D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- B. AS E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Remodel mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
 - 1. HardiPanel HZ10 vertical siding for 30 years.
 - 2. HardieSoffit HZ10 panels for 30 years.
 - 3. HardieTrim HZ10 boards for 15 years.
- B. Finish Warranty: Limited product warranty against manufacturing finish defects.
 - 1. When used for its intended purpose, properly installed and maintained according to Hardie's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the coverage for labor and material.
- C. Workmanship Warranty: Application limited warranty for 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: James Hardie Building Products, Inc.,
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

2.2 SIDING AND TRIM

- A. HardiePlank HZ10 lap siding, HardiPanel HZ10 vertical siding, HardieSoffit HZ10 panels and HardieShingle HZ10 siding requirement for materials:
 - 1. Fiber-cement siding - complies with ASTM C 1186 Type A Grade II.
 - 2. Fiber-cement siding - complies with ASTM E 136 as a noncombustible material.
 - 3. Fiber-cement siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
 - 4. ICC-ES evaluation reports ESR-2290, ESR-1844, and ESR-2273 (IBC, IRC, CBC, CRC)
 - 5. US Department of Housing and Urban Development Materials Release - 1263f.
- B. Vertical Siding: HardiePanel HZ10 siding as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Cedarmill Vertical siding panel 4 feet by 8 feet (1219 mm by 2438 mm).
- C. Soffit Panels: HardieSoffit HZ10 soffit panel, factory sealed on 5 sides as manufactured by James Hardie Building Products, Inc.
 - 1. Type: Textured Cedarmill vented, provides 5 square inches (32.3 sq.cm) of net free ventilation per linear foot, 16 inches (406 mm) by 12 feet (3658 mm).
 - 2. Thickness: 1/4 inch (6 mm).
- D. Trim:
 - 1. HardieTrim HZ10 boards as manufactured by James Hardie Building Products, Inc.
 - a. Product: Batten Boards, 2-1/2 inch (63 mm) width.
 - b. Product: 4/4 Boards, 7-1/4 inch (184 mm) width.
 - c. Texture: Rustic.
 - d. Length: 12 feet (3658 mm).
 - e. Thickness: 3/4 inch (19 mm).
 - 2. HardieTrim HZ10 Fascia boards as manufactured by James Hardie Building Products, Inc.
 - 3. Artisan HZ10 Accent trim as manufactured by James Hardie Building Products, Inc.
 - 4. Fiber-cement trim - complies with ASTM C 1186 Type A Grade II.
 - 5. Fiber-cement trim - complies with ASTM E 136 as a noncombustible material.
 - 6. Fiber-cement trim - complies with ASTM E 84 Flame Spread Index = 0,

- Smoke Developed Index = 5.
- 7. Intertek Product Listing.
- 8. Width: 7-1/4 inch (184 mm).
- 9. Texture: Smooth.

2.3 FASTENERS

- A. Wood Framing Fasteners:
 - 1. Wood Framing: Use manufacturer's recommended size and composition fasteners for the specific substrate.

2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: Factory primed by James Hardie.
 - 2. Topcoat: Refer to Section 09900 and Exterior Finish Schedule.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Nominal 2 inch by 4 inch (51 mm by 102 mm) wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Install Engineered for Climate HardieWrap weather barrier in accordance with local building code requirements.
- F. Use HardieWrap Seam Tape and joint and laps.
- G. Install and HardieWrap flashing, HardieWrap Flex Flashing.

3.3 INSTALLATION - HARDIEPANEL HZ10 VERTICAL SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Block framing between studs where HardiePanel siding horizontal joints occur.
- C. Install metal Z flashing and provide a 1/4 inch (6 mm) gap at horizontal panel joints.
- D. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- F. Maintain clearance between siding and adjacent finished grade.
- G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.

3.4 INSTALLATION - HARDIETRIM HZ10 BOARDS

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with a single board trim both side of corner.
- F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
- G. Allow 1/8 inch gap between trim and siding.
- H. Seal gap with high quality, paint-able caulk.
- I. Shim frieze board as required to align with corner trim..
- J. Fasten through overlapping boards. Do not nail between lap joints.
- K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
- L. Shim frieze board as required to align with corner trim.
- M. Install HardieTrim Fascia boards to rafter tails or to sub fascia.

3.5 FINISHING

- A. Finish factory primed siding with a minimum of two coats of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.6 PROTECTION

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

END OF SECTION

SECTION 07600 FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Metal counter flashing; and base flashing (if any).
 - 2. Metal wall flashing and expansion joints.
 - 3. Exposed metal trim/fascia units.
 - 4. Miscellaneous sheet metal accessories.
- B. Integral masonry flashings are specified as masonry work in sections of Division 4.

1.3 SUBMITTALS

- A. Product data; Flashing, Sheet Metal, and Accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- B. Samples of the following flashing, sheet metal, and accessory items:
 - 1. 8 inch square samples of specified sheet materials to be exposed as finished surfaces.
 - 2. 12 inch long samples of factory-fabricated products exposed as finished work. Provide complete with specified factory finish.
- C. Shop drawings showing layout, profiles, methods of joining, and anchorages details, including major counter-flashings, trim/fascia units, gutters, downspouts, scuppers and expansion joint systems. Provide layouts at 1/4 inch scale and details at 3 inch scale.

1.4 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM MATERIALS

- A. Aluminum: ASTM B 209, alloy 3003, temper H14, acrylic finish; 0.032 inch thick (20 gage) except as otherwise indicated.
- B. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, acrylic finish; 0.080 inch minimum thickness for primary legs of extrusions.

2.2 FLEXIBLE SHEET MEMBRANE FLASHING

- A. Elastic Sheet Flashing/Membrane: Non-reinforced flexible, black elastic sheet flashing of 50 to 65 mils thickness and complying with the following:
 - 1. Shore A Hardness (ASTM D 2240): 50 to 70.
 - 2. Tensile Strength (ASTM D 412): 1200 psi.
 - 3. Tear Resistance (ASTM D 624, Die C): 20 lbs. per linear inch.
 - 4. Ultimate elongation (ASTM D 412): 250 percent.
 - 5. Low temperature brittleness (ASTM D 746): minus 30 degrees F (minus 35 degrees C).
 - 6. Resistance to ozone aging (ASTM D 1149): no cracks for 10 percent elongated sample for 100 hours in 50 pphm (50.5 mPa) ozone at 104 degrees F (70 degrees C).
 - 7. Resistance to Heat Aging (ASTM D 573): maximum hardness increase of 15 points, elongation reduction of 40 percent, and tensile strength reduction of 30 percent, for 70 hours

at 212 degrees F (100 degrees C).

- B. Acceptable Products:
1. Neoprene synthetic rubber sheet.
 2. Butyl synthetic rubber sheet.
 3. EPDM synthetic rubber sheet.

2.3 FABRICATED UNITS

- A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, tin edges to be seamed, form seams, and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed or extruded aluminum joint covers, for installation behind main members where possible. Fabricate mitered and welded corner units.

PART 3 – EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
1. Install counter flashing in reglets, either by snap-in seal arrangement, or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.
- E. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous, waterproof system.

3.2 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.
- B. Protection: Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering at time of substantial completion.

END OF SECTION 07600

SECTION 07900 JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this Section.

1.2 DESCRIPTION OF WORK

- A. The extent of each type of joint sealer is indicated on the drawings or by installation instructions of various elements to be included into the work, sometimes by abbreviations as indicated herein.
- B. The required applications include, but are not necessarily limited to the following:
 - 1. Partition and ceiling joints.
 - 2. Miscellaneous joints at windows and doors.

1.3 SUBMITTALS

- A. Manufacturer's Data, Joint Sealers: Submit manufacturer's specifications, recommendations and installation instructions for each type of material required. Include manufacturer's published data, or letter certification, or certified test laboratory report indicating that each material complies with the specified standards and other requirements and is intended generally for the applications shown.

1.4 JOB CONDITIONS

- A. The Installer must examine the joint surfaces and backing, and their anchorage to the structure, and the conditions under which the joint sealer work is to be performed, and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work and performance of the sealers. Do not proceed with the joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in lower third of manufacturer's recommended installation temperature range.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Colors: For exposed materials provide color as indicated or, if not indicated, as selected by Architect from manufacturer's standard colors. For concealed materials, provide the natural color which has the best overall performance characteristics.
- B. Hardness: As recommended by manufacturer for application shown, unless otherwise indicated.
- C. Modules of Elasticity: Provide the lowest available modules of elasticity which is consistent with exposure to weathering, indentation, vandalism, abrasion, support of loading, and other requirements.
- D. Compatibility: Before purchase of each required material, confirm its compatibility with each other material it will be exposed to in the joint system.
- E. Size and Shape: As shown or, if not shown, as recommended by the manufacturer for the type and condition of joint, and for the indicated joint performance or movement.
- F. Grade of Sealant: For each application, provide the grade of sealant (non-sag, self-leveling, no-track, knife grade, preformed, etc) as recommended by the manufacturer for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions), to achieve the best possible overall performance. Grades specified herein are for normal condition of installation.

- G. Foot Traffic Exposures: In sealant locations subject to foot traffic, provide manufacturer's non-tracking variation of specified sealant, capable of withstanding stiletto heel traffic without damaging indentation.
- 2.2 NON-ELASTOMERIC SEALANTS
 - A. Acrylic-Emulsion Sealant (AcEm-S): Acrylic-emulsion or latex-rubber-modified acrylic-emulsion sealant compound permanently flexible, non-staining and non-bleeding: recommended by manufacturer for protected exterior exposure. Extent: all interior joints.
- 2.3 MISCELLANEOUS MATERIALS
 - A. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
 - A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.
- 3.2 JOINT PREPARATION
 - A. Clean joint surfaces immediately before installation of sealant or calking compound. Remove dirt, insecure coating, moisture and other substances which would interfere with bond of sealant or caulking compound. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces as recommended by sealant manufacturer.
 - B. Prime or seal the joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.
- 3.3 INSTALLATION
 - A. Set joint filler units at proper depth or position in the joint to coordinate with other work, including the installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of joint filler units.
 - B. 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 vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
 - C. Install sealants to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead;
 - 1. For joints sealed with non-elastomeric sealants and calking compounds, fill joints to a depth in the range of 75% to 125% of joint width.
 - D. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces. Clean the adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
 - E. Recess exposed edges of gaskets and joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from the joint.
- 3.4 CURE AND PROTECTION
 - A. Cure sealants and calking compounds in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Advise the Contractor of procedures required for the cure and protection of joint sealers during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Owner's acceptance.

END OF SECTION 07900

**SECTION 08110
STEEL DOORS AND FRAMES**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of standard steel doors and frames is indicated and scheduled on drawings.
- B. Finish hardware is specified elsewhere in Division-8.

1.3 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.
- B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows", and have been tested, listed, and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.
- C. Each door shall bear a label or otherwise be suitably identified as to the name of manufacturer and compliance with applicable standard.
- D. Field-verify all dimensions, conditions, and construction for each type of installation.
 - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.
- B. Shop Drawings: Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
 - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.
- B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4" high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide ¼" spaces between stacked doors to promote air circulation.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering steel doors and frames which may be incorporated in the work include; but are not limited to, the following:

1. Steel Doors and Frames, (General):
 - a. Anweld/Div. American Welding & Mfg. Co.
 - b. Ceco Corp.
 - c. Republic Builders Products Corp./Subs. Republic Steel.
 - d. All exterior doors and frames may be provided by the pre-manufactured building manufacturer provided criteria set forth herein are met.
- 2.2 MATERIALS:
 - A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.
 - B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
 - C. Supports and Anchors: Fabricate of not less than 18 gage galvanized sheet steel.
 - D. Inserts, Bolts, and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.
 - E. Shop Applied Paint:
 1. Primer: Rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.
- 2.3 FABRICATION, GENERAL:
 - A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory- assembled before shipment, to assure proper assembly at project site. Comply with SDI-100 requirements as follows:
 1. Exterior Doors: SDI 100, Grade II, heavy duty, Model 1, minimum 18-gauge faces, minimum 1 lb. density rigid foam core with a minimum R. factor of 4.6.
 - B. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot- rolled steel (at fabricator's option).
 - C. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.
 1. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.
 2. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
 3. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.
 - D. Shop Painting:
 1. Clean, treat, and paint exposed surfaces of steel door and frame units, including galvanized surfaces.
 2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, and other foreign materials before application of paint.
 3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.
- 2.4 STEEL DOORS:
 - A. Provide metal doors of types and styles indicated on drawings or schedules.
- 2.5 STANDARD STEEL FRAMES:
 - A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16-gage cold-rolled furniture steel.
 1. Shop fabricate frames with metered, welded corners and grind to provide smooth surface for

- painting.
- B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

PART 3 - INSTALLATION

3.1 INSTALLATION:

- A. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions for Steel Frames", unless otherwise indicated.
1. Install fire-rated frames in accordance with NFPA Std. No. 80.
 2. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.
- C. Door Installation:
1. Fit hollow metal doors accurately in existing frames, within clearances specified in SDI-100.
 2. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

3.2 ADJUST AND CLEAN:

- A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.
- B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08110

**SECTION 08210
WOOD DOORS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this Section.

1.02 DESCRIPTION OF WORK

- A. The extent and location of each type of wood door is shown on the drawings and in schedules by the abbreviation WD or other abbreviations as indicated herein.
- B. The types of doors required include the following:
 - 1. Solid core flush wood doors with veneer faces.

1.03 QUALITY ASSURANCE

- A. General: Comply with the requirements of the following standards unless otherwise indicated.
- B. Non-Fire Rated Wood Doors: NWWDA Industry Standard I.S. 1 "Wood Flush Doors" of the National Wood Window and Door Association.
- C. Fire-Rated Wood Doors: Where fire-resistance classifications are shown or scheduled for wood door assemblies, provide doors which comply with the requirements of NFPA No. 80 "Standard for Fire Doors and Windows" and which have been tested and rated with single point hardware by UL.
 - 1. Provide UL label on each door and panel.

1.04 SUBMITTALS

- A. Manufacturer's Data; Wood Doors:
 - 1. Submit door manufacturer's product data specifications and installation instructions for each type of wood door required, including other data as may be required to show compliance with specified requirements. Transmit copy of each instruction to the installer.
 - 2. Include details of core and edge construction, trim for openings and louvers (if any) and similar components.
- B. Shop Drawings; Wood Doors:
 - 1. Submit shop drawings indicating the location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
- C. Warranty; Wood Doors:
 - 1. Submit written agreement in door manufacturer's standard form signed by the Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show photographing of construction below in face veneers, or do not conform to tolerance limitations of NWWDA.
 - 2. Warranty shall be in effect during the following period of time after the date of acceptance. Solid Core Flush Interior Doors: Two years, or manufacturer's standard if longer than two years.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On-Site Care" recommendations of NWWDA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. General: Provide wood doors complying with the applicable requirements of NWWDA I.S. 1 for the kinds and types of doors indicated and as further specified.
 - 1. Face Panels: Manufacturer's standard 2- or 3-ply face panels, unless otherwise indicated.
 - 2. Exposed Surfaces: Provide the kind shown or scheduled and as further specified. Provide same exposed surface material on both faces of each door, unless otherwise indicated.
 - 3. Fire-rated Doors: Provide exposed faces and edges to match non-fire-rated doors in the same area of the building, unless otherwise indicated. Provide trim for openings (if any) which have been tested and listed for kind of door and rating indicated.

2.02 GENERAL FABRICATION REQUIREMENTS

- A. Openings: Where openings are indicated, cut and trim openings through doors and panels as shown. Comply with the applicable requirements of the referenced standard for the kind(s) of doors required.
 - 1. Light Openings: Factory cut openings. Trim openings for non-fire-rated doors with solid wood moldings of the profile shown.

2.03 INTERIOR FLUSH WOOD DOORS

- A. Solid Core Wood Doors (SC-WdDor as indicated on drawings as "WD"): Type II water-resistant bond.
- B. Core Construction: Solid wood block or mineral with wood lock blocks, as required by door manufacturer to comply with specified warranty period.
- C. Face Panels: Manufacturer's standard 2- or 3-ply face panels.
- D. Exposed surfaces for Transparent Finish: Where solid core interior wood doors are shown or scheduled to receive a transparent finish, provide manufacturer's standard thickness face veneers of the following quality.
 - 1. Quality: NWWDA I.S. 1 Premium grade face veneers of the species and cut shown or scheduled. Book-match (match for color and grain) at veneer joints, unless otherwise indicated. Provide exposed edges and other exposed solid wood components of the same species as face veneers. Face veneer: match veneer of existing doors in existing building.

PART 3 – EXECUTION

3.01 INSPECTION

- A. Installer must examine door frames and verify that frames are the correct type and have been installed as required for proper hanging of corresponding doors and notify the Contractor in writing of conditions detrimental to the proper and timely installation of wood doors. Do not proceed with installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
 - 1. Install fire-rated doors in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80.

3.02 INSTALLATION

- A. Condition doors to average prevailing humidity in installation area prior to hanging.
- B. Hardware: See 85-Series sections of these specifications.
- C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.
- D. Job Fit Doors: Align doors to frame for proper fit and uniform clearance at each edge and machine for hardware. Seal cut surfaces after fitting and machining.
 - 1. Bevel non-fire rated doors 1/8" in 2" at lock and hinge edges.
 - 2. Bevel fire-rated doors 1/16" in 2" at lock edge.

- E. Clearance: For non-fire doors provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
 - 1. For fire-rated doors, provide clearances complying with the limitations of the authority having jurisdiction.
- F. Job Site Finished Doors: See painting sections of these specifications for requirements for finishing wood doors.

3.03 ADJUST & CLEAN

- A. Operation: Rehang or replace doors which do not swing or operate freely, as directed by the Architect.
- B. Protection and Completed Work: Advise Contractor of proper procedures required for protection of installed wood doors from damage or deterioration until acceptance of the work.

END OF SECTION 08210

**SECTION 08550
ALUMINUM CLAD WOOD MAGNUM DOUBLE HUNG WINDOW**

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Aluminum clad wood magnum double hung window complete with hardware, glazing, weather strip, simulated divided lite, and standard or specified anchors, trim, attachments, and accessories.

1.02 RELATED SECTIONS

- A. Section 01330—Submittal Procedures: Shop Drawings, Product Data, and Samples.
- B. Section 01620—Product Options.
- C. Section 01630—Product Substitution Procedures.
- D. Section 01650—Product Delivery.
- E. Section 01660—Storage and Handling Requirements.
- F. Section 01710—Examination.
- G. Section 01720—Preparation.
- H. Section 01730—Execution.
- I. Section 01740—Cleaning.
- J. Section 01760—Protecting Installed Construction.
- K. Section 06200—Millwork: Wood trim other than furnished by window manufacture.
- L. Section 07920—Joint Sealants: Sill sealant and perimeter caulking.
- M. Section 09900—Paints and Coatings: Paint or stain other than factory applied finish.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. E 283-91: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
 - 2. E 330-90: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
 - 3. E 547-93: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
 - 4. E 774-92: Specification for Sealed Insulated Glass Units.
 - 5. C 1036-91: Standard Specification for Flat Glass.
- B. American National Standards Institute / National Wood Window and Door Association (ANSI / NWWDA):
 - 1. I.S.2-93: Industry Standard for Wood Windows.
 - 2. I.S.4-94: Industry Standard for Water Repellent Preservative Treatment for Millwork.
- C. National Wood Window and Door Association (WMDA): 101 / I.S.2-93 WDMA Hallmark Certification Program.
- D. Sealed Insulating Glass Manufacturers Association / Insulating Glass Certification Council (SIGMA / IGCC).
- E. American Architectural Manufacturers Association (AAMA): 2604-98 Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels.
- F. National Fenestration Rating Council (NFRC): 101-97: Procedure for Determining Fenestration Product Thermal Properties.

1.04 SYSTEM DESCRIPTION

- A. Design and Performance Requirements:

1. Window Units shall be designed to comply with NWWDA I.S.2-93, DP30.
2. Air leakage shall not exceed the following when tested at 1.57 psf according to ASTM E 283-91: 0.25 cfm per square foot of frame.
3. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547-93: 4.5 psf.
4. Window assembly shall withstand the following positive or negative uniform static air pressure difference without damage when tested according to ASTM E 330-90: 45 psf.

1.05 SUBMITTALS

- A. Shop Drawings: Submit shop drawings under provisions of Section 01330.
- B. Product Data: Submit catalog data under provisions of Section 01330.
- C. Samples:
 1. Submit corner section under provisions of Section 01330.
 2. Include glazing system, quality of construction, and specified finish.
- D. Quality Control Submittals: Certificates: Submit manufacturer's certifications indicating compliance with specified performance and design requirements under provisions of Section 01330.

1.07 DELIVERY

- A. Comply with provisions of Section 01650.
- B. Deliver in original packaging and protect from weather.

1.08 STORAGE AND HANDLING

- A. Prime or seal wood surfaces, including surface to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.
- B. Store window units in an upright position in a clean and dry storage area above ground and protect from weather under provisions of Section 01660.

1.09 WARRANTY

- A. Windows shall be warranted to be free from defects in manufacturing, materials, and workmanship for a period of ten (10) years from purchase date.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Description: Factory assembled Magnum Double Hung window, and related stationary units as manufactured by Marvin Windows and Doors, Warroad, Minnesota (or approved equal). Operating sash tilt to interior for cleaning or removal.

2.02 ALUMINUM CLAD WOOD DOUBLE HUNG MATERIALS

- A. Frame: Finger jointed edge-glued pine head and side jambs with interior clear veneer, kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication. Water repellent preservative treated in accordance with ANSI / NWWDA I.S.4-94. Frame thickness: 1-1/16 inch (27 mm) head and side jambs, 15/16 inches (24 mm) sill. Frame width: 5-1/2 inches (140 mm). Exterior extruded aluminum clad 0.062 inch (1.6 mm) thick.

- B. Sash: Clear pine kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication. Water repellent preservative treated in accordance with ANSI / NWWDA I.S.4-94. Composite sash thickness: 1-3/4 inches (44 mm), 2 inches (51 mm) for picture units. Corners slot and tenoned. Sash exterior extruded aluminum clad 0.055 inch (1.4 mm) thick. Removable exterior vinyl glazing stops with extruded aluminum covers..
- C. Glazing: Select quality complying with ASTM C 1036-91. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 774-92.
 - 1. Glazing method:
Insulated glass
 - 2. Glass type:
Low E II
 - 3. Glazing seal: Silicone bedding.
- D. Finish:
 - 1. Exterior: Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2604-98 requirements. Standard color: (to be selected).
 - 2. Interior: Latex prime coat, white.
- E. Hardware:
 - 1. Balance system: Double coil spring block and tackle with nylon cord and metal clutch.
 - 2. Jamb track: Vinyl extrusion with foam backing. Color: (to be selected).
 - 3. Lock: Keyed lock. Two locks on glass sizes of 36 inches (914 mm) and wider. Finish: Phosphate coated and electrostatically painted (color to be selected).
 - 4. Sash retainer plates: Polycarbonate thermoplastic. Color: (to be selected).
- F. Weather strip: Continuous, leaf weather strip at head jamb parting stop which seals against top sash; dual durometer double leaf at check rail; bulb type dual durometer weather strip at vinyl hardware track. Color: Beige. Jamb Extension: Factory installed jamb extension for wall thickness indicated or required. Finish: Match interior frame finish.
- J. Simulated Divided Lites (SDL): [7/8 inch (22 mm)wide] [1-1/8 inch (29 mm) wide] [with internal spacer bars] Exterior muntins: 0.055 inch (1.4 mm) thick extruded aluminum. Interior muntins: Pine. Muntins adhered to glass with double coated acrylic foam tape.
 - 1. Pattern: [Rectangular] [Custom lite layout].
 - 2. Finish: Match sash finish.

2.03 ACCESSORIES AND TRIM

- A. Installation Hardware and Accessories:
 - 1. Factory installed vinyl nailing fin/drip cap.
 - 2. Installation brackets: 6-3/8 inches (162 mm).
 - 3. Masonry brackets: 6 inches (152 mm).
 - 4. Sash lifts: High pressure zinc die-cast. Color: (to be selected).
- B. Aluminum Extrusions:
 - 1. Profile: Brick mould casing as indicated on drawings.
 - 2. Finish: Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2604-98 requirements. Standard color: (to be selected).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension as required in Section 01710. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

3.02 INSTALLATION

- A. Comply with Section 01730.
- B. Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.
- C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07920 Joint Sealants. Do not use expansive foam sealant.
- D. Install accessory items as required.

3.03 CLEANING

- A. Remove visible labels and adhesive residue according to manufacture's instructions.
- B. Leave windows and glass in a clean condition. Final cleaning as required in Section 01740.

3.04 PROTECTING INSTALLED CONSTRUCTION

- A. Comply with Section 01760.
- B. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

END OF SECTION

**SECTION 08700
FINISH HARDWARE**

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work in this section shall include the furnishing of all items of finish hardware as hereinafter specified, or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specification.

1.02 RELATED WORK

- A. The following sections of this specification should be examined in order to identify materials or equipment which may be obtained through this section.
1. Section 08100 - Doors and Frames
 2. Section 08210 - Wood Doors

1.03 DESCRIPTION OF WORK

- A. **FINISH HARDWARE** - hardware used in building construction but particularly that used on or in connection with doors, frames, cabinets and other movable members. It also has a finished appearance as well as functional purpose and may be considered as a part of the decorative treatment of a room or building.

1.04 QUALITY ASSURANCE

- A. Hardware has been specified herein by manufacturer's name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function. No other products will be furnished unless approved by means of 1.04 paragraph "D".
- B. To insure a uniform basis of acceptable materials, it is the intention that only manufacturer's items specified as "acceptable and approved" be furnished for use on this project.
- C. Deviation from or modification of items will be permitted only for special instances caused by reason of construction characteristics and for the purpose of providing proper operational function properly.
- D. Substitutions – requests for substitutions of items of hardware other than those listed as "Acceptable and Approved" shall be made to the architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be by addenda. Requests for substitutions shall be accompanied by showing design, functions, material thickness and any other pertinent information needed to compare your product with that specified. Lack of this information will result in a refusal. Substitution Review Process requires that supplier send one sample of copy of information to: **TDA Architects, LLC, 125 West Columbus Street, Dadeville, AL 36853.**
- E. Supplier - a recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two (2) years, and who is, or has in full time employment an Architectural Hardware Consultant (AHC) in good standing as certified by the Society of Architectural Council or equivalent, and who is a direct distributor of the products approved for warranty purposes. This paragraph will be strictly enforced. All schedules will be signed by an AHC.

1.05 SUBMITTALS

- A. The finish hardware supplier shall, after award of a formal contract, submit to the architect, six (6) complete computerized or typewritten (handwritten are not acceptable) copies of the proposed finish hardware schedule for approval. The schedule shall be prepared using the "Sequence and Format" for the Door and Hardware Institute (DHI). After approval of the schedule to the contractor for file and distribution purposes. Hardware will not be ordered by the hardware supplier until an approved schedule has been received. Horizontal schedules will not be

acceptable. Provide vertical format.

- B. When submitting schedules for approval, include two manufacturers cut sheets on each hardware item proposed. Index it with the use of number or letters or a combination of both, with the hardware schedule. The index numbers/letters are to be in right hand column on the same line as the respective manufacturer's numbers. All manufacturers' numbers shall be indexed even when appearing more than once.
- C. Templates - the hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce or otherwise prepare their material or product to receive the hardware supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. All items of hardware to be delivered to the jobsite shall be completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and where necessary installation templates for manufactures' suggested installation. All boxes are to have a typed label with door hand, room location, item number and keying to conveniently identify them and their intended location in the building.
- B. A representative of the general contractor shall receive the hardware when delivered at the jobsite. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting, checking and storage.
- C. Finish hardware shall be delivered to the general contractor by the hardware supplier. Direct factory shipments to the jobsite are not acceptable.
- D. The hardware shall be jointly inventoried by representatives of the general contractor and the hardware supplier.
- E. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the general contractor.
- F. All hardware shall be handled in a manner to minimize marring, scratching, or damage.

1.07 WARRANTY

All hardware shall have one year warranty except door closers which shall have a twenty-five year warranty as applicable for the closer specified.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware are indicated in the hardware schedule at the end of this section.

2.02 FINISH OF HARDWARE

Finish of items shall be as listed in the hardware schedule and shall conform to ANSI A156.18 UNLESS otherwise specified.

2.03 HINGES AND PIVOTS

- A. Template hinges: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template hinges which conform to ANSI whenever applicable.
- B. Hinge pins, except as otherwise indicated, shall be as follows:
 - 1. Steel Hinges: Steel pins.
 - 2. Non-Ferrous Hinges: Stainless Steel pins
 - 3. Exterior doors: Non-removable pints (NRP) or security stud.
 - 4. Out-swing corridor doors: Non-removable pins (NRP), whether specified in the hardware sets

- or not.
 - 5. Interior doors: Non-rising pins.
 - 6. Tips: flat button and matching plug, finished to match leaves, except where hospital tip indicated.
 - 7. All exterior doors to have stainless steel (630) and interior doors to be satin chrome (652).
 - C. Where projection of door trim is such as to prevent desired degree of opening, the proper hinge shall be provided to allow the door to clear the trim.
 - D. Acceptable and approved only as follows:
 - 1. Stanley
 - 2. Hager
 - 3. Deltona
- 2.04 KEYS AND KEYING
- A. Coordinate keying with Owner's master keying system. Construction master key all locks. Furnish (6) cut master keys, control, and construction keys and (3) cut change keys for each locking cylinder. All locks are to be provided with 6-pin interchangeable core, factory keyed. No exception allowed.
- 2.05 LOCKSETS AND LATCHSETS
- A. Acceptable and approved as follows:
 - 1. Arrow QL Series
 - 2. Best Lock 93K14D
 - 3. Corbin/Russwin CL3400 Series; ML2200
 - 4. Deltona Clarendon Series
 - B. No other substitutions allowed.
- 2.06 CLOSERS
- A. Accepted and approved only as follows:
 - 1. LCN 4040 Series
 - 2. Arrow 300 Series
 - 3. Corbin/Russwin DC2200 Series
 - B. No other substitutions will be allowed.
 - C. All closers shall be mounted on interior side of rooms. All closers to be mounted with wood or machine screws at all doors.
 - D. All closers to have full metal covers and delayed action.
 - E. All interior closers shall have adjustable spring power from sizes 1-4 and be capable of compliance with 5 lb. Interior barrier-free opening force restrictions. All exterior closers shall have adjustable spring power from sizes 2-6 and be capable of installation to meet 8.5 lb. exterior and 15 lb. fire door opening force restrictions.
 - F. All closers to have a twenty-five year written warranty.
 - G. All closers must be from the same manufacturer.
- 2.07 FLAT GOODS
- A. Accepted and approved only as follows:
 - 1. Quality
 - 2. Trimco
 - 3. Hager Accent Trim
 - 4. Deltona
 - B. It is the responsibility of the hardware supplier to provide proper screw attachments per wall or floor conditions for door stops.
 - C. Provide stops for each and every interior and exterior opening. It is the hardware supplier's responsibility to furnish proper fasteners for every stop, whether specified or not.

- D. Kickplates and armor plates shall be equal to Quality series #48 and shall be mounted by sheet metal screws where indicated in hardware sets, unless specified otherwise in hardware sets.
- E. Where stainless steel plates are specified, metal shall be .050" thickness' 4 beveled edges; with countersunk screw holes.

2.08 EXIT DEVICES

- A. Accepted and approved for use on wood and hollow metal doors:
 - 1. Monarch 17 & 18 Series
 - 2. Von Duprin 33 & 98 Series
 - 3. American Device 4300/6300
- B. No other substitutions will be allowed.
- C. Where doors have glass molding which projects from face of door, provide exit device shim kits for clearance purposes. These kits shall be the product of the exit device manufacturer. Provide where required whether specified in the hardware sets or not.
- D. All exposed parts of exits, including trim, must be satin stainless steel; no exceptions.

2.09 THRESHOLDS AND WEATHERSTRIPPING

- A. Accepted and approved as follows:
 - 1. Pemko
 - 2. Zero
 - 3. Reese

2.10 KEY CABINET

- A. Provide two tag key cabinet with 150% capacity.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Mount hardware units at heights indicated in "recommended locations for builders hardware" for (standard steel doors and frames), (custom steel doors and frames), (wood doors and frames) by the Door and Hardware Institute (DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the handicapped, or if otherwise directed by the architect.
- B. Degree of opening for doors with overhead holders, closers, etc., shall be included in the hardware schedule for the architects' approval.
- C. All hardware shall be installed by tradesmen skilled in the application of commercial grade hardware.
- D. Install each hardware item in compliance with the instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking, or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted and finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finishes have been completed on the surface to which the hardware is to be applied.
- E. At exterior doors and elsewhere as indicated, set thresholds in a bed of sealant as specified in Section 07900 to completely fill concealed voids and exclude moisture from every source. Do not plug drain holes or block weeps. Remove excess sealant.
- F. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the owner when the building is accepted. Included shall be at least five each of any special adjusting and/or installation tools furnished with the hardware by the manufacturers.

3.02 ADJUSTING AND CLEANING

- A. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- B. Final adjustment: Wherever hardware installation is made more than one month prior to building acceptance or occupancy of a space or area, the installer shall return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Hardware shall be cleaned as necessary to restore correct operation, function, and finish. Door control devices shall be adjusted to compensate for final operation of heating and ventilating equipment.

3.03 PROTECTION

- A. Whenever hardware is located in areas where it may be subject to damage during construction by handling, cleaning, etc., (E.G., painting, cleaning of bricks) it shall be protected and/or removed from its location until the hazardous condition is terminated.

3.04 GENERAL NOTES

- A. Before the installation of any hardware, the contractor's installer shall contact the hardware supplier to discuss any special installation requirements for all hardware items. Their discussion shall include, but not be limited to such items as proper closer mounting, proper fasteners to be used for hardware, lockset and exit device backsets, etc.
- B. Electric power tools should not be used on hardware fasteners so as to prevent damage to screw heads
- C. Hex nut bolts shall not be used for mounting door closers or exit devices on hollow metal doors. Doors shall be drilled and tapped in reinforced areas for installation.
- D. Hardware supplier should verify all quantities indicated in the following schedule.

3.05 SCHEDULES

- A. The following is a general listing of hardware requirements and is not intended for use as a final hardware schedule. Any items of hardware required by established standards of practices, or to meet state and local codes shall be furnished whether or not specifically called out in the following listed groups.
- B. All hardware shall be furnished in accordance with Life-Safety Code requirements and conform to State and Local Building Codes and fire protection requirements. All hardware at labeled openings shall be UL approved. Hardware Contractor shall be responsible for furnishing hardware in accordance with Codes whether specified or not. All hardware shall be furnished in compliance with the Uniform Federal Accessibility Standard (UFAS) requirements.

Hardware Set 1

3	Hinge - F179 4.5 X 4.5 X 652	ST
1	Passage Lever - QL01 SR X 26D X 306 X 2 3/4 ASA	AR
1	Deadlock - D61-IC X 26D X 144 X 345 (2 3/4" BS)	AR
1	Combinated Core - 7100CR X 626 Required Keyway	AR
1	Closer – DC325-1 X AL	AR
1	Stop - 442CP/406 X 630 As Required	RW
1	Door Bottom - 35VA-36" / 32" X 628	NG
1	Threshold - 425-36" / 32" X LES As Required	NG
1	Weatherstrip - 160-36" / 32" X 84" X 628 As Required	NG
3	Silencers 608	RW

Hardware Set 2

3	Hinge - F179 4.5 X 4.5 X 652 X NRP	ST
1	Privacy Lever - QL72SR X 26D X 306 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
2	Kickplates 10 X 34 X 630	RW
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 3

3	Hinge - F179 4.5 X 4.5 X 652	ST
1	Classroom Lever - QL87SR X 26D X 306 X 2 3/4 ASA	AR
1	Electronic Strike – FAS HS125SLD w/ Button (or approved equal) FAS-RNT-230SADK Card Reader Kit for Electric Strikes	
1	Closer – DC325-1 X AL	AR
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Note: Strike release to be located in Reception Office. Consult with Architect for location.

Hardware Set 4

3	Hinge - F179 4.5 X 4.5 X 652	ST
1	Classroom Lever - QL87SR X 26D X 306 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 5

3	Hinge - F179 4.5 X 4.5 X 652	ST
1	Passage Lever - QL01SR X 26D X 306 X 2 3/4 ASA	AR
1	Deadlock - D61-IC X 26D X 144 X 345 (2 3/4" BS)	AR
1	Combinated Core - 7100CR X 626 Required Keyway	AR
1	Closer – DC325-1 X AL	AR
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 6

3	Hinge F179 4.5 X 4.5 X 652	ST
1	Passage Lever QL01SR X 306 X 626 X 2 3/4 ASA	AR
1	Wall Stop 409	IVES
3	Silencer 608 Metal Frame	RW

Hardware Set 7

3	Hinge - F179 4.5 X 4.5 X 652	ST
1	Classroom Lever - QL87SR X 26D X 306 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 8

3	Hinge - F179 4.5 X 4.5 X 652 X NRP	ST
1	Privacy Lever - QL72SR X 26D X 306 X 2 3/4 ASA	AR
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 9

3	Hinge - F179 4.5 X 4.5 X 652 X NRP	ST
1	Passage Lever – QL01SR X 26D X 306 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
2	Kickplates 10 X 34 X 630	RW
1	Wall Stop - 409	RW
3	Silencer - 608 Metal Frame	RW

Hardware Set 10

3	Hinge FBB168 4.5 X 4.5 X 652	ST
1	Privacy Lever L02SR X 306 X 626 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
2	Kickplates 10 X 34 X 630	RW
1	Wall Stop 409	RW
2	Silencer 608 Metal Frame	RW

Hardware Set 11

6	Hinge FBB168 4.5 X 4.5 X 652	ST
1	Privacy Lever L02SR X 306 X 626 X 2 3/4 ASA	AR
1	Closer – DC325-1 X AL	AR
1	Astragal – 84” Style 140 Insulated Double Door Astragal (Acoustical Solutions)	
2	Flush Door Bolts 6” Satin	Baldwin

2	Kickplates 10 X 34 X 630	RW
1	Wall Stop 409	RW
2	Silencer 608 Metal Frame	RW

Hardware Set 12

6	Hinge F179 4.5 X 4.5 X 652	ST
2	Roller Catch 592 X 626	RW
2	Dummy Lever L08SR X 626 X 2 ¾ ASA	AR
2	Wall Stop 409	RW
2	Silencer 608 Metal Frame	RW

END OF SECTION 08700

**SECTION 08800
GLASS AND GLAZING**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials used to install glass. Types of work in this section include glass and glazing for:
 - 1. Window wall/store front construction.
 - 2. Entrances and other doors not indicated as "preglazed".

1.03 QUALITY ASSURANCE

- A. Prime Glass Manufacturer: One of the following for each type/color/pattern of glass:
 - 1. Ford Glass Company
 - 2. Libbey-Owens-Ford Company
 - 3. PPG Industries, Inc.
- B. Prime Glass Standard:
 - 1. FS DD-G-451
- C. Safety Glass Standard:
 - 1. CPSC 16 CFR 1201

PART 2 – PRODUCTS

2.01 GLASS PRODUCTS

- A. Float/Plate Glass: Type I, Quality q3, clear unless otherwise indicated.

2.02 PROCESSED GLASS

- A. 1" Insulated glass of ¼" Solex green as manufactured by PPG or approved equal.

2.03 FABRICATED GLASS UNITS

- A. Laminated Safety Glass: Laminate 2 sheets of clear float glass with a 30-mil film of polyvinyl buteral, by manufacturer's standard heat-plus-pressure process with dirt, air pockets and foreign substances excluded; ¼" thick if not otherwise indicated.
- B. Fused-Glass-Edged Insulating Glass: Provide manufacturer's standard double-pane unit, with 3/16" dry air or gas filled space, with -20° F (-31° C) dew point; and with glass sheets fused together at edges to provide a permanent hermetic seal. Fabricate with 1 sheet of 1/8" clear sheet glass, Quality q5 (DSA) and with 1 sheet of 1/8" bronze sheet glass.

2.04 GLAZING SEALANTS AND COMPONENTS:

- A. General: Provide color of exposed sealant/compound indicated or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.
- B. 1 Part Silicone Rubber Glazing Sealant: Elastomeric silicone sealant complying with FS TT-S-001543, Class A, non-sag. Provide acid type recommended by manufacturer where only

nonporous bond surfaces are contacted; provide nonacid type recommended by manufacturer where one or more porous bond surfaces are contacted.

2.05 GLAZING GASKETS

- A. Polyvinyl Chloride Glazing Gaskets: Extruded, flexible PVC gaskets of the profile and hardness shown, or as required for watertight construction; comply with ASTM D 2287.

2.06 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Neorene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.
- C. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.
- D. Compressible Filler (Rod): Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 – EXECUTION

3.01 STANDARDS AND PERFORMANCE:

- A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.
- B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.
- C. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- D. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and except where more stringent requirements are indicated.
- E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers' Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.02 PREPARATION FOR GLAZING

- A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces when elastomeric sealants are used.
- B. Apply primer or sealant to joint surfaces when recommended by sealant manufacturer.

3.03 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located ¼ the of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.
- B. Provide spacers inside and out, of proper size and spacing, for glass tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness slightly less than final compressed thickness of tape.
- C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- D. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids of installing filler rods in channel at heel of jambs and head pending on light size, thickness and type of glass,

- and complying with manufacturer's recommendations.
- E. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
 - F. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
 - G. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.
 - H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when installation is subjected to movement. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead.
 - I. Gasket Glazing: Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in glazing system.

3.03 CURE, PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Cure sealants for high early strength and durability.
- B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
- C. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacture recommendations for final cleaning.

END OF SECTION 08800

**SECTION 09250
GYPSUM DRYWALL**

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.2 SUMMARY:
- A. Extent of each type of gypsum drywall construction required is indicated on Drawings.
 - B. This Section includes the following types of gypsum board construction:
 - 1. Gypsum board screw-attached to wood framing and furring members.
 - C. Wood framing and furring are specified in the following Division 6 sections:
 - 1. "Rough Carpentry."
- 1.3 DEFINITIONS:
- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.
- 1.4 SUBMITTALS:
- A. Product data from manufacturers for each type of product specified.
- 1.5 QUALITY ASSURANCE:
- A. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.
 - B. Fire-Resistance Rating: Where gypsum drywall systems with fire-resistance ratings are indicated, provide materials and installation which are identical with those of applicable assemblies tested per ASTM E 119 by Fire Testing laboratories acceptable to authorities having jurisdiction.
- 1.6 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
 - B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.
 - C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.
- 1.7 PROJECT CONDITIONS:
- A. Environmental Conditions, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
 - B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C).
 - C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS:
- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Gypsum Boards and Related Products:
 - a. Celotex Corp.
 - b. Domtar Gypsum Co.
 - c. Georgia-Pacific Corp.
 - d. Gold Bond Building Products Div., National Gypsum Co.
 - e. United States Gypsum Co.

- 2.2 GYPSUM BOARD:
 - A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.
 1. Thickness: Provide gypsum board in thicknesses indicated, or if not otherwise indicated, 5/8 inch thicknesses to comply with ASTM C 840 for application system and support spacing indicated.
 - B. Gypsum Wallboard: ASTM C 36, and as follows:
 1. Type: MR, in wet areas.
 2. Type: Type 'X' (all other locations), unless otherwise indicated.
 3. Edges: Tapered.
 4. Thickness: 5/8 inch, unless otherwise indicated.

- 2.3 TRIM ACCESSORIES:
 - A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:
 1. Material: Formed metal, plastic or metal combined with paper, with metal complying with the following requirement:
 - a. Sheet steel zinc-coated by hot-dip process.
 2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:
 - a. "LC" Bead, unless otherwise indicated.
 - b. "U" Bead where indicated.
 - c. "J" Mold where indicated.
 3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

- 2.4 GYPSUM BOARD JOINT TREATMENT MATERIALS:
 - A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.
 - B. Joint Tape: Paper reinforcing tape, unless otherwise indicated.
 - C. Setting-Type Joint Compounds: Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
 1. Where setting-type joint compounds are indicated for use as taping and topping compounds, use formulation for each which develops greatest bond strength and crack resistance and is compatible with other joint compounds applied over it.
 - D. Drying-Type Joint Compounds: Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
 1. Ready-Mix Formulation: Factory-premixed product.
 2. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
 3. Topping compound formulated for fill (second) and finish (third) coats.

- 2.5 MISCELLANEOUS MATERIALS:
 - A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.
 - B. Gypsum Board Screws: ASTM C 1002.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

- A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840.
- B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24 inches in alternate courses of board.
- C. Install wall/partition boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
- D. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
- E. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.
- F. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.
- G. Floating Construction: Where feasible, including where recommended by manufacturer, install gypsum board over wood framing, with "floating" internal corner construction.
- H. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.3 METHODS OF GYPSUM BOARD APPLICATION:

- A. Single-Layer Application: Install gypsum wallboard as follows:
 - 1. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated, and provide sheet lengths which will minimize end joints.
- B. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:
 - 1. Fasten to wood supports with screws.

3.4 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

- A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.
- B. Install corner beads at external corners.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.
 - 1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).
 - 3. Install J-type trim where indicated on drawings. Trim to be Gold Bond 500 or approved equal.
- D. Install plastic edge trim where indicated on wall panels at juncture with ceilings.
- E. Install control joints at locations indicated, or if not indicated, at spacings and locations

required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.5 FINISHING OF DRYWALL:

- A. General: Apply joint treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.
- B. Pre-fill open joints and rounded or beveled edges, if any, using setting-type joint compound.
- C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.
- D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:
 - 1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
 - 2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
 - 3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

3.6 PROTECTION:

- A. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction being without damage or deterioration at time of Substantial Completion.

END OF SECTION 09250

**SECTION 09310
CERAMIC TILE**

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:
 - 1. Ceramic mosaic tile.
 - 2. Glazed wall tile.
 - 3. Stone thresholds installed as part of tile installations.
 - 4. Crack-suppression membrane for thin-set tile installations.
 - 5. Metal edge strips installed as part of tile installations.
 - 6. Cementitious backer units installed as part of tile installations.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.

1.3 DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
 - 1. Level Surfaces: Minimum 0.6.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.
 - 2. Full-size units of each type of trim and accessory for each color and finish required.
 - 3. Stone thresholds in 6-inch (150-mm) lengths.
 - 4. Metal edge strips in 6-inch (150-mm) lengths.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile from one source or producer.
 - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
 - 1. Stone thresholds.
 - 2. Waterproofing.
 - 3. Metal edge strips.
 - 4. Cementitious backer units

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
 - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
 - 1. As indicated by manufacturer's designations
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.
 - 1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.3 TILE PRODUCTS

- A. Available Manufacturers:
 - 1. American Olean; Div. of Dal-Tile International Corp.
 - 2. Crossville Ceramics Company, L.P.
 - 3. Daltile; Div. of Dal-Tile International Inc.
 - 4. United States Ceramic Tile Company.
- B. Unglazed Ceramic Mosaic Tile CT-1: Factory-mounted flat tile as follows:
 - 1. Composition: impervious porcelain.
 - 2. Surface: Slip-resistant, with abrasive admixture.
 - 3. Module Size: 1 by 1 inch
 - 4. Nominal Thickness: 1/4 inch

5. Face: with cushion edges.
 6. Basis-of-Design Product: American Olean, unglazed ceramic mosaic tile – Sterling Silver A32
- C. Glazed Wall Tile CT-2: Flat tile as follows:
1. Module Size: 4-1/4 by 4-1/4 inches
 2. Thickness: 5/16 inch (8 mm).
 3. Face: Pattern of design indicated, with manufacturer's standard edges.
 4. Basis-of-Design Product: American Olean, glazed porcelain tile – Ice White 25
- D. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1. Base for Thin-Set Mortar Installations: Straight, module size 4-1/4 by 4-1/4 inches
 2. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches
 3. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
 4. External Corners for Thin-Set Mortar Installations: Surface bullnose.
 5. Internal Corners: Field-buttet square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.
- E. Accessories for Glazed Wall Tile: Provide vitreous china accessories of type and size indicated, in color and finish to match adjoining wall tile, and intended for installing by same method as adjoining wall tile.
1. One soap holder with grab handle for each shower and tub indicated.
- 2.4 THRESHOLDS
- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.
- B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
1. Description: Match Architect's sample.
- 2.5 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS
- A. General: Manufacturer's standard product that complies with ANSI A118.10.
- B. Fabric-Reinforced, Modified-Bituminous-Sheet Product: Self-adhering SBS-modified-bituminous sheet with woven reinforcement facing for adhering to latex-portland cement mortar; 36 inches (914 mm) wide by 0.040-inch (1.01-mm) nominal thickness.
- 2.6 SETTING AND GROUTING MATERIALS
- A. Manufacturers:
1. Bonsal, W. R., Company.
 2. Custom Building Products.
 3. C-Cure
 4. DAP, Inc.
 5. LATICRETE International Inc.
 6. MAPEI Corporation.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
1. For wall applications, provide nonsagging mortar that complies with Paragraph C-4.6.1 in addition to the other requirements in ANSI A118.1.
- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
 - a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

- D. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
 - 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F (60 deg C) and 212 deg F (100 deg C), respectively, and certified by manufacturer for intended use.
 - E. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.
 - F. Chemical-Resistant Furan Mortar: ANSI A118.5, with carbon filler, unless otherwise indicated.
 - G. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.
 - a. Unsanded grout mixture for joints 1/8 inch (3.2 mm) and narrower.
 - b. Sanded grout mixture for joints 1/8 inch (3.2 mm) and wider.
 - H. Chemical-Resistant Furan Grout: ANSI A118.5.
- 2.7 ELASTOMERIC SEALANTS
- A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."
 - B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
 - 1. Available Products:
 - a. Dow Corning Corporation; Dow Corning 786.
 - b. GE Silicones; Sanitary 1700.
 - c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
- 2.8 CEMENTITIOUS BACKER UNITS
- A. Provide cementitious backer units complying with ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
 - 1. Thickness: 1/2 inch
 - 2. Width: Manufacturer's standard width, but not less than 32 inches
 - B. Available Products:
 - 1. C-Cure; C-Cure Board 990.
 - 2. Custom Building Products; Wonderboard.
 - 3. USG Corporation; DUROCK Cement Board.
- 2.9 MISCELLANEOUS MATERIALS
- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
 - B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications, stainless steel; ASTM A 666, 300 Series exposed-edge material.
 - C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
 - D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
 - 1. Available Manufacturers:
 - a. C-Cure
 - b. Custom Building Products
 - c. MAPEI Corporation
- 2.10 MIXING MORTARS AND GROUT
- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - B. Add materials, water, and additives in accurate proportions.
 - C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
 - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with [adhesives] [or] [thin-set mortar] that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
 - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
 - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- H. Grout tile to comply with requirements of the following tile installation standards:
- I. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- 3.4 WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION
- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
 - B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
 - C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
- 3.5 FLOOR TILE INSTALLATION
- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
 - B. Joint Widths: Install tile on floors with the following joint widths:
 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
 - D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
 - E. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.
- 3.6 WALL TILE INSTALLATION
- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
 - B. Joint Widths: Install tile on walls with the following joint widths:
 1. Glazed Wall Tile: 1/16 inch (1.6 mm).
- 3.7 CLEANING AND PROTECTING
- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 1. Remove grout residue from tile as soon as possible.
 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
 - B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
 - C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
 - D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

**SECTION 09650
RESILIENT FLOORING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this section.

1.02 DESCRIPTION OF WORK

- A. Extent of flooring is indicated on drawings and finish schedule.

1.03 QUALITY ASSURANCE

- A. Follow guidelines and recommendations as set forth by "Resilient Floor Covering Institute".
- B. Wherever possible, provide resilient flooring and accessories produced by a single manufacturer.
- C. Salvaged materials may not be used.

1.04 SUBMITTALS

- A. Manufacturer's Data; Resilient Flooring: For information only, submit 2 copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory. Transmit a copy of each installation instruction to Installer.
- B. Samples; Resilient Flooring: Submit 3 sets of samples of each type, color and finish of resilient flooring and accessory required. Provide full-size tile units and 12" square samples of sheet flooring and 6" long sample of accessory. Include full range of flooring color and pattern variation. Sample submittals will be reviewed for color, texture and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
- C. Maintenance Instructions; Resilient Flooring: Submit 2 copies of manufacturer's written instructions for recommended maintenance practices for each type of resilient flooring and accessories.
- D. Replacement Material; Resilient Floors: After completion of work, deliver replacement materials to the project site, as follows:
 - 1. Tile flooring, not less than one box for each 50 boxes, or fraction thereof, for each type, size, and color installed
- E. Furnish replacement materials from the same manufactured lot as the materials installed.

1.05 JOB CONDITIONS

- A. Continuously heat areas to receive flooring to 70 degrees F. for at least 48 hours prior to installation, when project conditions are such that heating is required. Maintain 70 degrees F. temperature continuously during and after installation as recommended by flooring manufacturer, but for not less than 48 hours.

PART 2 - PRODUCTS

2.01 COLORS AND PATTERNS

- A. Provide colors as selected by architect from manufacturer's standards.

2.02 TILE FLOORING

- A. Vinyl Composition Tile (Composition 1): FS SS-T-312, Type IV, 12" x 12" x 1/8".
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Azrock Floor Products Div., Azrock Industries, Inc.

3. Kentile Floors, Inc.

2.03 ACCESSORIES

- A. Adhesives (Cements): As recommended by flooring manufacturer to suit material and substrate conditions.
- B. Resilient reducer strip and trim pieces: Provide reducer strip at all doors. Color of reducer strip and trim pieces as selected by Architect.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION

- A. Prior to laying flooring, remove wax and all other foreign mater (do not sand or dry scrape), broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.
 - 1. Remove all tile and fill void with Latex Under Layment as recommended by "Resilient Floor Covering Institute".
 - 2. Use latex leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.

3.02 INSTALLATION

- A. Install flooring after finishing operations, including painting, have been completed and permanent heating system is operating. Building air temperature and relative humidity must be within limits recommended by flooring manufacturer.
- B. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations for installation over existing tile floors. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces, door reveals, and into closets and similar openings.
- C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
- D. Install flooring on covers for telephone and electrical ducts, and other such items as occur within finished floor areas.
- E. Maintain overall continuity of color and pattern with pieces of flooring installed in these covers. Tightly cement edges to perimeter of floor around covers and covers.
- F. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
- G. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than ½ tile at room perimeters. Lay tile square to room axis, unless otherwise shown.
- H. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.
 - 1. Lay tile in "Checkerboard" fashion with grain reversed in alternate tile.

3.03 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring from damage by covering.
- B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories.
- C. Apply wax and buff, with type of wax, number of coats and buffing procedures in compliance with flooring manufacturer's instructions.

END OF SECTION 09650

**SECTION 09900
PAINTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
 - 1. Exposed exterior items and surfaces.
 - 2. Exposed interior items and surfaces.
 - 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - 1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork and casework.
 - b. Kitchen cabinets
 - c. Metal toilet enclosures.
 - d. Metal lockers.
 - e. Finished mechanical and electrical equipment.
 - f. Light fixtures.
 - g. Distribution cabinets.
 - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Furred areas.
 - b. Ceiling plenums.
 - c. Pipe spaces.
 - d. Duct shafts.
 - 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Bronze and brass.
 - 4. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:
 - 1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.
 - 2. Division 2 Section "Portland Cement Concrete Paving" for traffic-marking paint.
 - 3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
 - 4. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
 - 5. Division 9 Section "Gypsum Board" for surface preparation for gypsum board.
 - 6. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions

15 and 16, respectively.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
 - 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
 - 4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
 - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
 - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
 - 1. After color selection, the Architect will furnish color chips for surfaces to be coated.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected

from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
 - 1. Quantity: At the completion of work, provide 20 gallons of the color and type used in each coating material used. Cans shall be clearly identified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules (or approved equal).
- B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
 - 1. Devoe & Reynolds Co. (Devoe).
 - 2. Glidden Co. (The) (Glidden).
 - 3. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: Color selections will be made by the Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified. Seal all penetrations in wall, ceiling or floor prior to painting.
 1. Provide barrier coats over incompatible primers or remove and re-prime.
 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written

instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 8. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup painted.
 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Electrical items to be painted include, but are not limited to, the following:

1. Conduit and fittings.
 2. Switchgear.
 3. Panelboards.
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.
- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
 3. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished

surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

- A. Concrete Masonry Units: Provide the following finish systems over exterior concrete masonry units:
 - 1. Low-Luster Acrylic Finish: 2 finish coats over a block filler.
 - a. Block Filler: High-performance, latex block filler applied at spreading rate recommended by the manufacturer to achieve a total dry mill thickness of not less than 4.0 mils.
 - 1) Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler.
 - 2) Glidden: 5317 Ultra-Hide Block Filler Latex Interior-Exterior.
 - b. First and Second Coats: Low-luster (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.3 mils.
 - 1) Devoe: 16XX Wonder-Shield Exterior Acrylic Latex Satin House and Trim Paint.
 - 2) Glidden: 6700 Series Spred Ultra Exterior Satin Latex House and Trim Paint.
- B. Exterior Gypsum Soffit Board: Provide the following finish systems over exterior gypsum soffit board:
 - 1. Flat Acrylic Finish: 2 finish coats over an exterior, alkyd- or alkali-resistant primer, as recommended by the manufacturer.
 - a. Primer: Exterior, alkyd- or alkali-resistant, acrylic-latex primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Devoe: 1102 All-Weather Exterior Alkyd House Paint Primer.
 - 2) Glidden: Primer not required over this substrate.
 - b. First and Second Coats: Flat, exterior, acrylic-emulsion paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils.
 - 1) Devoe: 15XX Wonder-Shield Exterior Acrylic Latex Flat House Paint.
 - 2) Glidden: 3525 Series Spred House Masonry & Stucco Finish.
- C. Wood Trim: Provide the following finish systems over exterior wood trim:
 - 1. Medium-Shade, Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
 - 1) Devoe: 1102 All-Weather Exterior Alkyd House Paint Primer.
 - 2) Glidden: UH 790 Ultra-Hide Exterior Latex Prime Coat.
 - b. First and Second Coats: Semigloss, waterborne, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils.
 - 1) Devoe: 17XX Wonder-Shield Semi-Gloss Exterior Acrylic Latex House and Trim Paint.
 - 2) Glidden: 6600 Series Spred Ultra Exterior Gloss Latex House & Trim Paint.
- D. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
 - 3) S-W: Kem Kromik Metal Primer B50N2/B50W1.
 - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils.
 - 1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
 - 2) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
 - 3) S-W: Industrial Enamel B-54 Series.
 - E. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
 1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 8502/8520 Mirrolac-WB Interior/Exterior Waterborne Flat DTM Primer and Finish.
 - 2) Glidden: 5205 Glid-Guard Tank & Structural Primer, Red.
 - 3) S-W: Galvite Paint B50W3.
 - b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Devoe: 70XX Mirrolac Interior/Exterior Alkyd-Urethane Gloss Enamel.
 - 2) Glidden: 4500 Series Glid-Guard Alkyd Industrial Enamel.
 - 3) S-W: Industrial Enamel B-54 Series.
- 3.8 INTERIOR PAINT SCHEDULE
- A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:
 1. Semigloss, Alkyd-Enamel Finish: 2 finish coats over an undercoat and a filled surface.
 - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils.
 - 1) Devoe: 52902 Bloxfil 200 Interior/Exterior Latex Block Filler.
 - 2) Glidden: 5317 Ultra-Hide Block Filler, Latex Interior-Exterior.
 - 3) S-W: Heavy-Duty Block Filler B42W46.
 - b. Undercoat: Interior, alkyd- or latex-based, enamel undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 400 Ultra-Hide Alkyd Interior Enamel Undercoater.
 - 3) S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.
 - c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 3) S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.
 - B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 1. Ceilings - Flat Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

- 1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
 - 2) Glidden: 5111 Spred Ultra Latex Primer-Sealer.
 - b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.
 - 1) Devoe: 36XX Wonder-Tones Interior Latex Flat Wall Paint.
 - 2) Glidden: 4000 Series Spred Ultra Flat Latex Wall and Trim Paint.
 2. Walls - Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
 - 2) Glidden: 5111 Spred Ultra Latex Primer-Sealer.
 - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
 - 1) Devoe: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
 - 2) Glidden: 4100 Series Spred Ultra Eggshell Latex Wall & Trim Paint.
 3. Frames - Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
 - 2) Glidden: 5111 Spred Ultra Latex Primer-Sealer.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
 - 2) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
- C. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:
 1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 51701 Wonder-Prime All-Purpose Latex Primer Sealer & Vapor Barrier.
 - 2) Glidden: UH 400 Ultra-Hide Alkyd Interior Enamel Undercoater.
 - b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.
 - 1) Devoe: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
 - 2) Glidden: 8200 Series Spred Ultra Latex Semi-Gloss Enamel.
- D. Stained Woodwork: Provide the following stained finishes over new, interior woodwork:
 1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.
 - a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: None required.
 - 2) Glidden: Glidden Paste Wood Filler.
 - 3) S-W: Sher-Wood Fast-Dry Filler.
 - b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 96XX WoodWorks Alkyd Interior Stain.

- 2) Glidden: 1600 Series Woodmaster Oil Wood Stain.
 - 3) S-W: Oil Stain A-48 Series.
 - c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4900 WoodWorks Quick-Dry Clear Sealer.
 - 2) Glidden: 5035 Ultra-Hide Quick-Dry Sanding Sealer, Clear.
 - 3) S-W: ProMar Varnish Sanding Sealer B26V3.
 - d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4600 WoodWorks Alkyd Satin Varnish.
 - 2) Glidden: 82 Satin Sheen Woodmaster Polyurethane Clear Finishes Varnish.
 - 3) S-W: Oil Base Varnish, Gloss A66V91.
- E. Natural-Finish Woodwork: Provide the following natural finishes over new, interior woodwork:
- 1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
 - a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: None required.
 - 2) Glidden: Glidden Paste Wood Filler.
 - 3) S-W: Sher-Wood Fast-Dry Filler.
 - b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4900 WoodWorks Quick-Dry Clear Sealer.
 - 2) Glidden: 5035 Ultra-Hide Quick-Dry Sanding Sealer, Clear.
 - 3) S-W: ProMar Varnish Sanding Sealer B26V3.
 - c. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
 - 1) Devoe: 4600 WoodWorks Alkyd Satin Varnish.
 - 2) Glidden: 82 Satin Sheen Woodmaster Polyurethane Clear Finishes Varnish.
 - 3) S-W: Oil Base Varnish, Gloss A66V91.
- F. Ferrous Metal: Provide the following finish systems over ferrous metal:
- 1. Semigloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
 - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
 - 1) Devoe: 13101 Mirrolac Rust Penetrating Metal Primer.
 - 2) Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
 - 3) S-W: Kem Kromik Metal Primer B50N2/B50W1.
 - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 3) S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.
 - c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less

- than 1.4 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 3) S-W: Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.
- G. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:
- 1. Semigloss, Alkyd-Enamel Finish: One finish coat over an undercoat and a primer.
 - a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 13201 Mirrolac Galvanized Metal Primer.
 - 2) Glidden: 5207 Glid-Guard Tank & Structural Primer, White.
 - 3) S-W: Galvite Paint B50W3.
 - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 8400 Series Spred Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 3) S-W: ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.
 - c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
 - 1) Devoe: 26XX Velour Interior Alkyd Semi-Gloss Enamel.
 - 2) Glidden: UH 8400 Ultra Traditional Alkyd Semi-Gloss Enamel.
 - 3) S-W: Classic 99 Interior Alkyd Semi-Gloss Enamel A-40 Series.

END OF SECTION 09900

SECTION 10350 FLAGPOLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY:

- A. Extent and location of each type of flagpole is shown on drawings.

1.03 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.
- B. Shop Drawings: Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.
- C. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be requested.

1.04 QUALITY ASSURANCE:

- A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings accessories, bases, and anchorage devices.
- B. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavy pipe sizes if required for flagpole type and height shown.
- C. Pole Construction: Construct pole and ship to sit in one piece if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight hairline field joints.

1.05 DELIVERY, STORAGE AND HANDLING:

- A. Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.
- B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following: (or approved equal)
 1. Aabec Pole Div., Morgan-Francis Co.
 2. American Pole Div., of Kearney-National
 3. Concord Industries, Inc.
 4. Eder Flag Manufacturing. Co.

2.02 FLAGPOLE TYPE:

- A. Aluminum Flagpoles: Fabricate from seamless extruded tubing complying with ASTM B241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 30,000 psi and a yield point of 25,000 psi. Heat-treat and age-harden after fabrication.
 - 1. Provide cone tapered aluminum flagpoles.

2.03 FLAGPOLE MOUNTING:

- A. Provide manufacturer's standard base system for the type of flagpole installation required.

2.04 SHAFT FINISH:

- A. Aluminum: Fine, directional, mechanical satin polish, (NAAMM-M32), finished as follows:
 - 1. Natural clear anodized finish complying with NAMM-C22A41, Class 1 (0.7 mil).

2.05 FITTINGS:

- A. Finial Ball: Manufacturer's standard flush seam ball, size as indicated or, if not indicated, to match pole butt diameter.
- B. Truck: Ball -bearing non-fouling, revolving, double-track assembly of cast metal, finished to match pole shaft.
- C. Cleats: Two 9" cast metal cleats with fasteners, finished to match pole shaft.
- D. Halyards: Provide 2 continuous halyards for each flagpole, as follows:
- E. Nylon, braided, with metal core.
- F. Size: 3/8" (No. 12).
- G. Halyard Flag Snaps: Provide 2 swivel snaps per halyard, as follows:
 - 1. Bronze.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish and other foreign matter from excavation, and moisten earth before placing concrete.
- B. Concrete: Provide concrete composed of portland cement, coarse and fine aggregate and water, mixed in proportions to attain 28-day compressive strength of not less than 3000 psi, complying with ASTM C94.
- C. Place concrete immediately after mixing. Perform chuting to avoid segregation of mix. Compact concrete in place by use of vibrators. Moist-cure exposed concrete for not less than 7 days, or use a non-staining curing compound in cold weather.
- D. Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base perimeter.
- E. Flagpole Installation: Install flagpoles as shown and in compliance with final shop drawings and manufacturer's instructions.
- F. Provide positive lightning ground for each flagpole below grade with a heavy coat of bituminous paint.

END OF SECTION 10350

SECTION 10440 SPECIALTY SIGNS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to the work of this section.

1.02 DESCRIPTION OF WORK:

- A. Extent of specialty signs is shown on the drawings.
- B. Forms of specialty signs required include the following:
 - 1. Panel signs.
 - 2. Metal letters and numbers.

1.03 QUALITY ASSURANCE:

- A. Uniformity of Manufacturer: For each sign form and graphic image process indicated furnish products of a single manufacturer.

1.04 SUBMITTALS:

- A. Shop Drawings: Submit shop drawings for fabrication and erection of specialty signs. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorages and accessory items. Furnish location template drawings for items supported or anchored to permanent construction.
 - 1. Furnish full-size spacing templates for individual building- mounted letters and numbers.
 - 2. Furnish full-size rubbings for metal plaques.
- B. Product Data: Submit manufacturer's technical data and installation instructions for each type of sign required.
- C. Samples: Submit samples of each sign form and material showing finishes, colors, surface textures and qualities of manufacturer and design of each sign component including graphics.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, the following: (or approved equal)
 - 1. Manufacturers of Panel Signs:
 - a. Andco Industries Corp.
 - b. ASI Sign Systems, Inc.
 - c. Kroy Sign Systems.
 - 2. Manufacturers of Metal Letters and Plaques:
 - a. Andco Industries Corp.
 - b. ASI Sign Systems, Inc.
 - c. The Southwell Company.

2.02 MATERIALS:

- A. Plastic Laminate: Provide high pressure plastic laminate engraving stock with face and core plies in contrasting colors, in finishes and color combinations indicated, or if not indicated, as selected from the manufacturer's standards.
- B. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.
- C. Aluminum Extrusions: Provide aluminum extrusions of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T5.
- D. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the aluminum producer or finisher for the casting process used and for the use and finish indicated.
- E. Bronze Castings: Provide bronze castings, copper alloy UNS C83600, complying with the requirements of ASTM B 584.
- F. Fasteners: Unless otherwise indicated, use concealed fasteners fabricated from metals that are non-corrosive to either the sign materials or the mounting surface.
- G. Anchors and Inserts: Use non-ferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 FABRICATION:

- A. Panel Signs: Fabricate panel signs to comply with the requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, designs, shapes, sizes and details of construction.
 - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16" measured diagonally.
- B. Unframed Panel Signs: Fabricate unframed panel signs with edges mechanically and smoothly finished to conform with the following requirements:
 - 1. Edge Condition: Rounded.
 - 2. Edge Color for Plastic Laminate: Provide edge color same as the background.
 - 3. Corner Condition: Provide square corners of 1/2".
- C. Graphic Image Process:
 - 1. Graphic Content and Style: Provide sign copy to comply with the requirements indicated for sizes, styles, spacing, content, positions, materials, finishes and colors of letters, numbers, symbols and other graphic devices.
 - 2. Engraved Copy: Machine-engrave letters, numbers, symbols and other graphic devices into sign panel on the face indicated to produce precisely formed copy, incised to uniform depth. Use high speed cutters mechanically linked to master templates in a pantographic system or equivalent process capable of producing characters of the style indicated with sharply formed edges.
 - a. Engraved Plastic Laminate: Engrave through the exposed face ply of the plastic laminate sheet to expose the contrasting core ply.
 - 1.) Engrave the copy to produce a minimum indentation depth of 1/32" and a minimum stroke width of 1/4".
 - 3. Metal Letters and Numbers: Provide metal letters and numbers to comply with the requirements indicated for the manufacturing process, materials, finish, style, size and message content.
 - a. Fabricated Letters and Numbers: Fabricate letters and numbers to the required sizes and styles, using metals and thicknesses indicated below. Form exposed

faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories as required.

1.) Aluminum Sheet: Not less than 0.090" thick. Fabricate by the heliarc welding process.

2.04 FINISHES:

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standard.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.
- C. Aluminum Finishes:
 - 1. Baked Enamel Finish: Provide finish AA-M4xC12C42R1x (manufacturer's standard non-directional mechanical finish including sanding and filing, cleaning with inhibited chemicals, conversion coated with an acid-chromate-fluoride-phosphate treatment and painted with organic coating specified below).
 - a. Organic Coating: Provide manufacturer's standard thermosetting enamel system consisting of a prime coat and a finish coat.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. General: Locate sign units and accessories as directed by the Architect, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install sign units level, plumb and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods recommended by manufacturer for specific substrate.
- C. Metal Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for the letter form, type of mounting, wall construction and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount letters 3/4" from the wall surface.
- D. Cast Metal Plaques: Mount cast plaques using the standard methods recommended by plaque manufacturer for the type of wall surface indicated.
 - 1. Concealed Mounting: Mount the plaques by inserting threaded studs into tapped lugs on the back of plaque. Set in predrilled holes filled with quick-setting cement.

3.02 CLEANING AND PROTECTION:

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.03 SCHEDULE:

- A. Provide the following;
 - Business Hours - (coordinate with Owner)
 - Coordinate with Owner for 1 panel sign for each interior door opening from the Corridors.

END OF SECTION 10440

**SECTION 10522
FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Provide fire extinguisher and accessories for four locations to be determined by the Architect. They are to be semi-recessed. One shall only require a fire extinguisher with mounting bracket.
- B. Definition: "Fire extinguisher" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.
- C. Types of products required include:
 - 1. Fire extinguisher.
 - 2. Fire extinguisher cabinets.
 - 3. Mounting brackets.

1.3 QUALITY ASSURANCE:

- A. Single Source Responsibility: Obtain products in this section from one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguisher which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.
- C. FM Listed Products: Provide new portable fire extinguisher which are approved by Factory Mutual Research Corporation for type, rating, and classification of extinguisher indicated and carry appropriate FM marking.

1.4 SUBMITTALS:

- A. Product Data: Submit product data for each type of product included in this section. For fire extinguisher cabinets, include roughing-in dimensions and details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, and panel style and materials.
- B. Samples: Submit for verification purposes, samples of each required finish. Prepare samples on metal of same gage as used for actual production run. Where normal color variations are to be expected, include 2 or more units in each sample set showing limits of variation.
 - 1. For initial selection of colors and finishes, submit manufacturer's color cards showing full range of standard colors available.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. J.L. Industries
 - 2. Larsen's Mfg. Co.
 - 3. Johnson-Lee, Division of W.F. Lee Corp.
 - 4. Muckle Manufacturing, Division of Technico, Inc.
 - 5. Accessory Specialties.

2.2 FIRE EXTINGUISHER:

- A. General: Provide fire extinguisher for each extinguisher cabinet and other locations indicated,

in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.

1. Fill and service extinguisher to comply with requirements of governing authorities and manufacturer's requirements.
- B. Abbreviations indicated below to identify extinguisher types related to UL classification and rating system and not, necessarily to type and amount of extinguishing material contained in extinguisher.
- C. Multi-Purpose Dry Chemical Type: UL-rated 4-A:6-B:C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

2.3 MOUNTING BRACKETS:

- A. Provide manufacturer's standard brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish.
 1. Provide brackets for extinguisher to be located in Mechanical Room.

2.4 FIRE EXTINGUISHER CABINETS:

- A. General: Provide fire extinguisher cabinets where indicated, or suitable size for housing fire extinguisher of types and capacities indicated.
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door and hardware to suit cabinet type, trim style, and door style indicated. Weld all joints and grind smooth. Miter and weld perimeter door frames.
- C. Cabinet Type: Suitable for mounting conditions indicated, of the following types:
 1. Semi-Recessed: Cabinet box (tub) partially recessed in walls of shallow depth.
- D. Trim Style: Fabricate trim in one piece with corners mitered, welded and ground smooth.
 1. Provide recessed flange, of same material as box, attached to box to act as plaster stop.
- F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 1. Enameled Steel: Manufacturer's standard flush, hollow steel door construction with tubular stiles and rails.
 2. Door Glazing: Clear float glass complying with FS DD-G-451, type I, class 1, quality q3.
- G. Door Style: Manufacturer's standard design as indicated below.
 1. Full-Glass Panel: Float glass, 1/8" thick.
- I. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam action latch, or door pull, exposed or concealed, and friction latch. Provide concealed or continuous type hinge permitting door to open 180 degrees.

2.5 FACTORY FINISHING OF FIRE EXTINGUISHER CABINETS:

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.
- B. Painted Finishes: Provide painted finish to comply with requirements indicated below for extent, preparation and type:
 1. Extent of Painted Finish: Apply painted finish to both concealed and exposed surfaces of cabinet components except where other than a painted finish is indicated.
 2. Color: Provide color or color matches indicated, or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.
 3. Preparation: Clean surfaces of dirt, grease, and loose rust or mill scale.
 4. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply cabinet manufacturer's standard baked enamel finish system to the following surfaces:
 - a. Interior of cabinet.
 - b. Exterior of cabinet except for those surfaces indicated to receive another finish.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
 - 3. Where exact location of cabinets and bracket-mounted fire extinguisher is not indicated, locate as directed by Architect.

3.2 IDENTIFICATION:

- A. Identify existence of fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" applied to door by process indicated below. Provide lettering to comply with requirements indicated for letter style, color, size, spacing and location or, if not otherwise indicated, as selected by Architect from manufacturer's standard arrangements.
 - 1. Application Process: Silk screen.
- B. Identify bracket-mounted extinguisher with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style and location as selected by Architect.

END OF SECTION 10522

**SECTION 10800
TOILET ACCESSORIES**

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

- A. Extent of each type of toilet accessory is indicated below.
- B. Types of toilet accessories required include the following:
 - 1. Toilet tissue dispenser. B-685 (1 ea. per water closet)
 - 2. Soap dispenser. B-111 (two per toilet)
 - 3. Paper towel dispenser. B-262 (two per toilet)
 - 4. Mirror unit. B-165-2436 (1 ea. per lavatory)
 - 5. Grab Bar B-68137 (1 ea. per H. C. water closet)
 - 6. Grab Bar B-6868 (one per shower stall)
 - 7. Folding Shower Seat B-5171 (one per shower stall)
 - 8. Towel pin B-6777 (one per shower stall and one per H.C. toilet stall)

1.03 QUALITY ASSURANCE:

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.
- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units.
- C. Products: Provide products of same manufacturer for each type of accessory unit and for units exposed in same areas, unless otherwise acceptable to Architect.

1.04 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.
- B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices and cut-out requirements in other work.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

- A. Manufacturers: Provide toilet accessories as scheduled on the drawings. Substitutions will be considered subject to compliance with requirements.
 - 1. Bobrick Washroom Equipment, Inc.

2.02 MATERIALS, GENERAL:

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gage (.034") minimum, unless otherwise indicated.
- B. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.
- C. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality q2, ¼" thick, with silver coating, copper protective coating, and non-metallic paint coating complying with FS DD-M-411.
- D. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.03 FABRICATION:

- A. General: Only an unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Provide concealed anchorage wherever possible.
- C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without metered corners. Provide anchorage which is fully concealed when unit is closed.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install toilet accessory units in accordance with manufacturers' instructions, using fasteners which are appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.02 ADJUSTING AND CLEANING:

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 12390 KITCHEN CABINETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

- A. Extent of kitchen cabinets is indicated on drawings.
- B. Coordinate installation of range hoods as specified in Section 15100.

1.03 QUALITY ASSURANCE:

- A. Kitchen Cabinet Standard: ANSI A161.1.
 - 1. NKCA Certification: Where indicated, provide kitchen cabinets with National Kitchen Cabinet Association (NKCA) "Certified Cabinet" seal affixed in a semi-concealed location of each unit, evidencing compliance with above standard.
- B. Countertop Standard: ANSI A161.2.
 - 1. Field Measurements: Verify sizes and shapes of base cabinets, wall cabinets and countertops prior to fabrication by field measurements.

1.04 SUBMITTALS:

- A. Shop Drawings: Submit shop drawings showing location and size of each type of cabinet and countertops, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to countertop and to walls.
- B. Samples: Submit fully finished samples of kitchen Base cabinet unit and Wallhung cabinet unit for approval before fabrication.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect wood cabinets and countertops during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver wood cabinets and countertops until painting, wet work, grinding and similar operations, which could be performed before installation of kitchen cabinets, have been completed in installation areas. Store kitchen cabinets and countertops in installation areas or, if that is impracticable, in areas with ambient conditions meeting same requirements.

1.06 JOB CONDITIONS:

- A. Conditioning: Manufacturer shall advise Contractor of temperature and humidity requirements for cabinet installation areas. Do not install cabinets and countertops until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed cabinet work within a tolerance range of the optimum moisture content acceptable to cabinet manufacturer, from date of installation through remainder of construction period.

PART 2 - PRODUCTS

2.01 DEFINITIONS:

- A. Exposed portions of cabinets include all surfaces including edges visible when doors and drawers are closed. Also included are visible surfaces and visible edges of shelves in open cabinets.
- B. Semi-exposed portions of cabinet include surfaces behind opaque doors and drawer fronts including shelves, dividers, interior faces of cabinet ends, backs, tops and bottoms, drawer sides, backs and bottoms, and back face of doors.
- C. Concealed portions of cabinets include sleepers, web frame, dust panels and other surfaces not normally visible after installation.

2.02 BASIC MATERIALS:

- A. Plastic Laminate: NEMA LD-3, of thickness, type and grade designation indicated; in colors of patterns and finishes indicated, or, if not indicated, as selected by Architect from manufacturer's standard selections.
- B. Hardwood Plywood: PS 51 (proposed ANSI A99.1), Good Grade (1) or better, of thickness, species, cut and core construction indicated.
- C. Hardwood Lumber: Clear, dry, sound, and free of defects selected from First Grade lumber (NHLA), of species indicated.
- D. Hardboard: ANSI A135.4, Class 1, tempered.

2.03 WOOD CABINETS, TRANSPARENT FINISH:

- A. Exposed Materials: Do not juxtapose materials noticeable dissimilar in color, grain, figure and natural color markings.
 - 1. Solid lumber: Selected for compatible grain and color of the following species:
 - 2. Natural Birch
 - 3. Northern Hard Maple.
 - 4. Red or White Oak.
 - 5. Plywood Face Veneer: Same species as exposed lumber, unless otherwise indicated, selected for grain and color compatible with exposed solid lumber, no defects. Edgeband exposed edges with solid wood of same species as face veneer.
- B. Semi-Exposed Materials:
 - 1. Solid Lumber: Dry, sound, selected to eliminate appearance defects, of any species of hardwood or softwood with color and grain characteristics similar to exposed portions.
 - 2. Plywood: Species to match color and grain of exposed members with veneer core.
 - 3. Concealed Members: Solid lumber or plywood, as indicated.
- C. Style of Face Construction:
 - 1. Face Frame Style: Provide base, wall and full height units (if any) with face frames of cabinets exposed around drawer fronts and doors.
 - a. Drawer Fronts and Doors: Surface applied to face frame.
 - 1) Flush Style Door Construction: Ladder core plywood, 3 ply with hardwood face veneers and crossbanding.
 - 2) Flush Style Drawer Fronts: Same construction as door.
- D. Cabinet Construction, General:
 - 1. Face Frames: Not less than 1" x 1-5/8" solid lumber rails and stiles with glued

- mortise and tenon joints.
2. Exposed Ends: Not less than 1/2" thick, 5 ply veneer core plywood. Connect to stile with pressure-glued tongue and plow joint, and supplemented by concealed mechanical fasteners.
 3. Unexposed Ends: Not less than 1/2" thick, 5 ply veneer core plywood. Attach to front frame in same manner as exposed ends.
 4. Back, Top and Bottom Rails: Not less than 3/4" x 3" solid lumber machined to interlock with end panels, and rabbeted to receive top and bottom panels; with back rails secured under pressure with glue and mechanical fastening devices.
 5. Shelving: Not less than 1/2" thick plywood.
- E. Wall Cabinet Construction:
1. Tops and Bottoms: Not less than 1/2" thick 3 ply plywood with tops and bottoms, fully supported by, and secured in, rabbets in end panels, front frame and back rail.
 2. Backs: Not less than 1/8" hardboard fastened to machined rear edge of ends and to top and bottom hanger rails.
- F. Base Cabinet Construction:
1. Front Frame Drawer Rails: Not less than 1" x 1-1/4" lumber mortised and fastened into face frame.
 2. Bottoms: Not less than 3/8" thick, 5-ply veneer core plywood secured in and fully supported rabbets in end panels, front frame and back bottom rail.
 3. Back Panels: Not less than 3/8" thick, 5 ply veneer core plywood, glued and fastened to machined rear edge of end panels and to top and bottom rails.
 4. Toe Boards: Not less than 3/4" treated wood attached between end panels and extended from bottom panel to floor.
 5. Corner Blocks: Glued and fastened in each of 4 top corners to maintain cabinet squareness and rigidity.
- G. Drawer Construction:
1. Drawer Body: Not less than 7/16" thick hardwood subfront, back and sides fully dovetailed and glued at all 4 corners. Exposed fronts fastened to subfront with mounting screws from interior of body. Drawer bottom of not less than 1/4" thick hardboard, set into rabbets in back, sides and front.
- H. Full-Height Cabinets:
1. Back Panels: Hardwood plywood of manufacturer's standard thickness for size and type of storage unit provided, but not less than 3/16" thick, unless otherwise indicated.
 2. Top and Bottom Panels: Minimum 3/8" thick hardwood plywood unless otherwise indicated.
 3. Corner Posts: Not less than 3/4" x 7/8" attached to all 4 vertical corners, fabricated with notches to provide adjustability and retainment of interior storage devices.

2.04 COUNTERTOPS:

- A. Exposed Surfacing Material: High pressure plastic laminate, 0.050" thick, General Purpose Type (GP50); except 0.042" thick, Postforming Type (PF42), where postformed countertop configuration is indicated.
- B. Substrate (Core) for Exposed Surfacing Material: Exterior grade plywood, with solid wood drip and splash. (No particleboard).
- C. Countertop Configuration: Provide countertops with the following front styles (nose), cove and backsplash style, unless otherwise indicated:
 1. Post-formed with rolled front, coved back and bullnose splash.

- D. Countertop Thickness: Not less than 1-1/2", unless otherwise indicated, with substrate (core) not less than 3/4" thick.
- E. Contractor shall provide a full range of plastic laminate samples to choose from.

2.05 TRANSPARENT FINISH FOR KITCHEN CABINETS:

- A. Shop Finishing: Finish cabinets at shop or factory to the greatest extent possible. Defer any final touch-up, cleaning and polishing until after delivery and installation. Apply finish in a properly equipped, temperature controlled spray room free from circulating dust, dirt, sawdust, and other foreign material.
- B. Preparation for Finishing: Carefully and smoothly machine sand parallel with grain, exposed and semi-exposed surfaces of cabinets. Handscrape or sand exposed surfaces to remove machine marks and scratches. Remove sanding residue and other foreign material.
- C. Finishing Materials: Manufacturer's standard products selected to comply with performance requirements in referenced kitchen cabinet standard.
- D. Exposed Surfaces: Apply finish as follows:
 - 1. Sealer Coat, if required.
 - a. Stain: To match color selected. Apply stain by hand wiping to produce maximum grain clarity, and color retention and uniformity. Allow to dry.
 - b. Sealer Coat: Catalytic curing resin-based coating to serve as initial moisture and chemical barrier and to produce bond for top coat. Allow to dry and scuff sand before applying top coat.
- F. Top Coat: Catalytic curing resin-based coating, heat-cured to a hard, smooth furniture finish, free of imperfections.

2.06 CABINET HARDWARE:

- A. General: Provide manufacturer's standard hardware units of type, size and finish indicated, complying with ANSI A 156.9, of type, material, size and finish indicated, or, if not indicated, as selected by Architect from manufacturer's standard choices.

2.07 FABRICATION:

- A. Fabricate wood kitchen cabinets to dimensions and profiles and details indicated.
- B. Assemble units in shop in as large components as practicable to minimize field cutting and jointing.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install cabinets plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where wood kitchen cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips and mouldings as indicated or required, and in finish to match cabinet face.
- B. Anchor cabinets securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions for support of units.
- C. Attach countertops securely to base units. Spline and glue joints in countertops; provide concealed mechanical clamping of joint. Provide cutouts for fixtures and

appliances as indicated; drill pilot holes at corners before making cutouts. Smooth cut edges and coat with waterproof coating or adhesive.

- D. Complete hardware installation and adjust doors and drawers for proper operation.
- E. Coordinate installation of kitchen sinks in countertops as shown on the drawings and specified in Section 15400. Sinks shall be flush with countertop and sealed with plumber's putty. No clear silicone will be accepted for installation.
- F. Coordinate installation of range hood as shown on drawings and as specified in Section 15100. Contractor shall be responsible for coordination of range vent duct and transitions to roof vents, or wall vents as shown on plans.

3.02 CLEANING AND PROTECTION:

- A. Repair or remove and replace defective work as directed upon completion of installation.
- B. Clean exposed and semi-exposed surfaces, touch-up finish as required. Remove and refinish damaged or soiled areas.
- C. Protection: Advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 12390

NORWOOD COMMUNITY CENTER ANNISTON HOUSING AUTHORITY ANNISTON, ALABAMA

Section 15010 - Basic Mechanical Requirements
Section 15050 - Basic Mechanical Materials and Methods
Section 15100 - Valves
Section 15145 - Hangers and Supports
Section 15150 - Sanitary Waste and Vent Piping
Section 15170 - Motors
Section 15183 - Refrigerant Piping
Section 15250 - Mechanical Insulation
Section 15411 - Water Distribution Piping
Section 15430 - Plumbing Specialties
Section 15440 - Plumbing Fixtures
Section 15820 - Duct Accessories
Section 15891 - Metal Ductwork
Section 15932 - Air Outlets and Inlets
Section 15990 - Testing, Adjusting and Balancing

WHORTON ENGINEERING, INC.

CONSULTING ENGINEERS

RANDALL WHORTON, P.E., C.E.M.

PH: (256)820-9897
FAX: (256)820-9896

25 SUMMERALL GATE ROAD
ANNISTON, ALABAMA 38205



SECTION 15010 BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 15.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

- 1. Submittals.
- 2. Coordination drawings.
- 3. Record documents.
- 4. Maintenance manuals.
- 5. Rough-ins.
- 6. Mechanical installations.
- 7. Cutting and patching.

- B. Related Sections: The following sections contain requirements that relate to this section:

- 1. Division 15 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
- 2. Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 15, plus general related specifications including:
 - a. Access to mechanical installations.
 - b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

1.3 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Increase, by the quantity listed below, the number of mechanical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Mechanical Consulting Engineer.

1. Shop Drawings - Initial Submittal: 1 additional blue- or black-line prints.
2. Shop Drawings - Final Submittal: 1 additional blue- or black-line prints.
3. Product Data: 1 additional copy of each item.
4. Samples: 1 addition as set.

C. Additional copies may be required by individual sections of these Specifications.

1.4 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Refer to Division 15 Section "Mechanical Identification." Indicate actual inverts and horizontal locations of underground piping.
3. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
4. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
5. Contract Modifications, actual equipment and materials installed.

1.5 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades,

compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 - 2. Verify all dimensions by field measurements.
 - 3. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 4. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 5. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form.
 - 6. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 - 7. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
 - 11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "ACCESS DOORS" and Division 15 Section "BASIC MECHANICAL MATERIALS AND METHODS."
 - 12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING

AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
1. Uncover Work to provide for installation of ill-timed Work.
 2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Install equipment and materials in existing structures.
 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
1. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 2. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

END OF SECTION 15010

**SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS**

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 basic mechanical materials and methods to complement other Division 15 Sections.
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Equipment nameplate data requirements.
 - 3. Field-fabricated metal and wood equipment supports.
 - 4. Installation requirements common to equipment specification sections.
 - 5. Mechanical demolition.
 - 6. Cutting and patching.
 - 7. Touchup painting and finishing.
- B. Pipe and pipe fitting materials are specified in Division 15 piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

- A. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.
- B. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
- B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning 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 prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.

- D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Metal, Flexible Connectors:
 - a. ANAMET Industrial, Inc.
 - b. Central Sprink, Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Grinnell Corp.; Grinnell Supply Sales Co.
 - f. Hyspan Precision Products, Inc.
 - g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
 - h. Mercer Rubber Co.
 - i. Metraflex Co.
 - j. Proco Products, Inc.
 - k. Uniflex, Inc.
 - 2. Rubber, Flexible Connectors:
 - a. General Rubber Corp.
 - b. Mercer Rubber Co.

- c. Metraflex Co.
- d. Proco Products, Inc.
- e. Red Valve Co., Inc.
- f. Uniflex, Inc.

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe 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 15 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
 - 3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
 - 4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
 - 5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.
- C. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- D. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Solvent Cements: Manufacturer's standard solvent cements for the following:
 - 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.

2.4 FLEXIBLE CONNECTORS

- A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating, unless higher

working pressure is indicated, and ends according to the following:

1. 2-Inch NPS (DN50) and Smaller: Threaded.
 2. 2-1/2-Inch NPS (DN65) and Larger: Flanged.
 3. Option for 2-1/2-Inch NPS (DN65) and Larger: Grooved for use with keyed couplings.
- B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.
- C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose. Do not use for potable water
- D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose. Do not use for potable water.
- E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig (860-kPa) minimum working-pressure rating at 220 deg F (104 deg C). Units may be straight or elbow type, unless otherwise indicated. Do not use for potable water unless units comply with NSF61.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.6 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 0.0239-inch (0.6-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.

2.7 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 15 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product

category.

- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.
 - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
 - 2. Location: Accessible and visible location.
- C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.
- D. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.
- E. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:
 - 1. Green: Cold air.
 - 2. Yellow: Hot air.
 - 3. Yellow/Green or Green: Supply air.
 - 4. Blue: Exhaust, outside, return, and mixed air.
 - 5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
 - 6. Nomenclature: Include the following:
 - a. Direction of airflow.
 - b. Duct service.
 - c. Duct origin.
 - d. Duct destination.
 - e. Design cubic feet per meter (liters per second).
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.
 - 1. Fabricate in sizes required for message.
 - 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
 - 3. Punch for mechanical fastening.
 - 4. Thickness: 1/16 inch (1.6 mm), for units up to 20 sq. in. (130 sq. cm) or 8 inches (200 mm) long; 1/8 inch (3.2 mm) for larger units.
 - 5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:
 - 1. Green: Cooling equipment and components.
 - 2. Yellow: Heating equipment and components.
 - 3. Yellow/Green: Combination cooling and heating equipment and components.

4. Brown: Energy reclamation equipment and components.
 5. Blue: Equipment and components that do not meet any criteria above.
 6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
 7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Name and plan number.
 - b. Equipment service.
 - c. Design capacity.
 - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.
 8. Size: Approximate 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment.
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

2.8 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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 at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.

- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Sleeves are not required for core drilled holes.
- N. Permanent sleeves are not required for holes formed by PE removable sleeves.
- O. 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 (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).
 - b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) 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 (50 mm) above finished floor level.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe

- or pipe insulation, using elastomeric joint sealants.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- P. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) in diameter and larger.
 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 5. 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:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. 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.
 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.

7. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. PVC Pressure Piping: ASTM D 2672.
 - c. PVC Nonpressure Piping: ASTM D 2855.

- U. Piping Connections: Make connections according to the following, unless otherwise indicated:
 1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
 2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 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.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical 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.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
 1. Plastic markers, with application systems. Install on insulation segment if required for

- hot, uninsulated piping.
2. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:
 - a. Near each valve and control device.
 - b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
 - c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
 - d. At access doors, manholes, and similar access points that permit view of concealed piping.
 - e. Near major equipment items and other points of origination and termination.
 - f. Spaced at maximum of 50-foot (15-m) intervals along each run. Reduce intervals to 25 feet (7.5 m) in congested areas of piping and equipment.
 - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.
1. Lettering Size: Minimum 1/4-inch- (6.4-mm-) high lettering for name of unit if viewing distance is less than 24 inches (610 mm), 1/2-inch- (12.7-mm-) high lettering for distances up to 72 inches (1800 mm), and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
 2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.
1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet (15 m).
- D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.
- ### 3.4 PAINTING AND FINISHING
- A. Apply paint to exposed piping according to the following, unless otherwise indicated:
1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
 2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.

3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

B. Do not paint piping specialties with factory-applied finish.

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

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

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical 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.

3.7 DEMOLITION

A. Disconnect, demolish, and remove Work specified in Division 15 Sections.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches (50 mm) beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from Project site.

- F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.8 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

3.9 GROUTING

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

END OF SECTION 15050

SECTION 15100 VALVES

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 general duty valves common to several mechanical piping systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.
- C. Maintenance data for valves to include in the operation and maintenance manual. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.
- B. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.5 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 globe and gate 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 indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Gate Valves:
 - a. Crane Company; Valves and Fitting Division.
 - b. Hammond Valve Corporation.
 - c. Kitz Corp. of America.
 - d. Lunkenheimer/Cincinnati Valve Co.
 - e. Milwaukee Valve Company, Inc.
 - f. NIBCO Inc.
 - g. Powell: Wm. Powell Company (The).
 - h. Red-White Valve Corp.
 - i. Stockham Valves & Fittings, Inc.
 2. Ball Valves:
 - a. Conbraco Industries, Inc.; Apollo Division.
 - b. Hammond Valve Corporation.
 - c. Milwaukee Valve Company, Inc.
 - d. NIBCO Inc.
 - e. Stockham Valves & Fittings, Inc.
 - f. Tyler Pipe.
 - g. Victaulic Company of America.
 3. Plug Valves:
 - a. Grinnell Corp.
 - b. Huber: J.M. Huber Corp.; Flow Control Division (Resun Valves).
 - c. NIBCO Inc.
 - d. Stockham Valves & Fittings, Inc.
 - e. Victaulic Company of America.

4. Globe Valves:
 - a. Crane Company; Valves and Fitting Division.
 - b. Hammond Valve Corporation.
 - c. Kitz Corp. of America.
 - d. Lunkenheimer/Cincinnati Valve Co.
 - e. Milwaukee Valve Company, Inc.
 - f. NIBCO Inc.
 - g. Powell: Wm. Powell Company (The).
 - h. Red-White Valve Corp.
 - i. Stockham Valves & Fittings, Inc.

5. Butterfly Valves:
 - a. Center Line, Mark Controls Corporation.
 - b. Crane Company; Valves and Fitting Division.
 - c. General Signal; DeZurik Unit.
 - d. Grinnell Corp.
 - e. Hammond Valve Corporation.
 - f. Keystone Valve USA, Inc.
 - g. Milwaukee Valve Company, Inc.
 - h. NIBCO Inc.
 - i. Red-White Valve Corp.
 - j. Stockham Valves & Fittings, Inc.
 - k. Tyler Pipe.
 - l. Ultraflo Corporation.
 - m. Victaulic Company of America.

6. Swing Check Valves:
 - a. Cla-Val Co.
 - b. Crane Company; Valves and Fitting Division.
 - c. Hammond Valve Corporation.
 - d. Kitz Corp. of America.
 - e. Lunkenheimer/Cincinnati Valve Co.
 - f. Milwaukee Valve Company, Inc.
 - g. NIBCO Inc.
 - h. Powell: Wm. Powell Company (The).
 - i. Red-White Valve Corp.
 - j. Stockham Valves & Fittings, Inc.
 - k. Victaulic Company of America.

7. Wafer Check Valves:
 - a. Cla-Val Co.
 - b. Conbraco Industries, Inc.; Apollo Division.
 - c. Hammond Valve Corporation.
 - d. Keystone Valve USA, Inc.
 - e. Kitz Corp. of America.

- f. Metraflex Company.
- g. Milwaukee Valve Company, Inc.
- h. NIBCO Inc.
- i. Red-White Valve Corp.
- j. Stockham Valves & Fittings, Inc.
- k. Tyler Pipe.
- l. Val-Matic Valve & Mfg. Corp.
- m. Victaulic Company of America.

8. Lift Check Valves:

- a. Crane Company; Valves and Fitting Division.
- b. Kitz Corp. of America.
- c. Milwaukee Valve Company, Inc.
- d. NIBCO Inc.
- e. Powell: Wm. Powell Company (The).
- f. Red-White Valve Corp.
- g. Stockham Valves & Fittings, Inc.

2.2 BASIC, COMMON FEATURES

- A. Design: Rising stem or rising outside screw and yoke stems, except as specified below.
 - 1. Nonrising stem valves may be used only where headroom prevents full extension of rising stems.
- B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.
- C. Sizes: Same size as upstream pipe, unless otherwise indicated.
- D. Operators: Use specified operators and handwheels, except provide the following special operator features:
 - 1. Handwheels: For valves other than quarter turn.
 - 2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 10 plug valves.
 - 3. Chain-Wheel Operators: For valves 4 inches and larger, installed 96 inches or higher above finished floor elevation.
 - 4. Gear-Drive Operators: For quarter-turn valves 8 inches and larger.
- E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.
- G. Threads: ASME B1.20.1.

- H. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.
- I. Solder Joint: ASME B16.18.
 - 1. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.3 GATE VALVES

- A. Gate Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.
- B. Gate Valves, 3 Inches and Larger: MSS SP-70, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with 2-piece packing gland assembly, flanged end connections; and with cast-iron handwheel.

2.4 BALL VALVES

- A. Ball Valves, 4 Inches and Smaller: MSS SP-110, Class 150, 600-psi CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch valves and smaller and conventional port for 3/4-inch valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:
 - 1. Operator: Steel handwheel.
 - 2. Operator: Vinyl-covered steel lever handle.
 - 3. Operator: Vinyl-covered steel tee handle.
 - 4. Operator: Lever operators with lock.
 - 5. Stem Extension: For valves installed in insulated piping.
 - 6. Memory Stop: For operator handles.

2.5 PLUG VALVES

- A. Plug Valves: MSS SP-78, 175-psi CWP, ASTM A 126 cast-iron body and bonnet, cast-iron plug, Buna N, Viton, or teflon packing, flanged or grooved end connections:
 - 1. Operator: Lever.
 - 2. Operator: Worm and gear with handwheel, sizes 6 inches and larger.
 - 3. Operator: Worm and gear with chain wheel, sizes 6 inches and larger, 96 inches or higher above floor.

2.6 GLOBE VALVES

- A. Globe Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.
- B. Globe Valves, 3 Inches and Larger: MSS SP-85, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

2.7 BUTTERFLY VALVES

- A. Butterfly Valves: MSS SP-67, 200-psi CWP, 150-psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, wafer, lug, or grooved style:
 - 1. Disc Type: Nickel-plated ductile iron.
 - 2. Operator for Sizes 2 Inches to 6 Inches: Lever handle with latch lock.

2.8 CHECK VALVES

- A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, or Class 150, 300-psi CWP; horizontal swing, Y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections:
- B. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.
- C. Wafer Check Valves: Class 125, 200-psi CWP, ASTM A 126 cast-iron body, bronze disc/plates, stainless-steel pins and springs, Buna N seals, installed between flanges.
- D. Lift Check Valves: Class 125, ASTM B 62 bronze body and cap (main components), horizontal or vertical pattern, lift-type, bronze disc or Buna N rubber disc with stainless-steel holder threaded or soldered end connections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.
- D. Examine threads on valve and mating pipe for form and cleanliness.
- E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION

- A. Install valves as indicated, according to manufacturer's written instructions.
- B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.
- C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. For chain-wheel operators, extend chains to 60 inches above finished floor elevation.
- H. Installation of Check Valves: Install for proper direction of flow as follows:
 - 1. Swing Check Valves: Horizontal position with hinge pin level.
 - 2. Wafer Check Valves: Horizontal or vertical position, between flanges.
 - 3. Lift Check Valve: With stem upright and plumb.

3.3 SOLDERED CONNECTIONS

- A. Cut tube square and to exact lengths.
- B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.
- C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

- D. Open gate and globe valves to fully open position.
- E. Remove the cap and disc holder of swing check valves having composition discs.
- F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.
- G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 THREADED CONNECTIONS

- A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.
- B. Align threads at point of assembly.
- C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.
- D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.5 FLANGED CONNECTIONS

- A. Align flange surfaces parallel.
- B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.
- C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.6 VALVE END SELECTION

- A. Select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube Size, 2-1/2 Inches and Smaller: Solder ends, except provide threaded ends for heating hot water.
 - 2. Steel Pipe Sizes, 2-1/2 Inches and Smaller: Threaded or grooved end.
 - 3. Steel Pipe Sizes, 3 Inches and Larger: Grooved end or flanged.

3.7 APPLICATION SCHEDULE

- A. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.

- B. Domestic Water Systems: Use the following valve types:
 - 1. Gate Valves: Class 125, bronze or cast-iron body to suit piping system.
 - 2. Ball Valves: Class 150, 600-psi CWP, with stem extension.
 - 3. Plug Valves: Neoprene-faced plug, Buna N packing.
 - 4. Globe Valves: Class 125, bronze or cast-iron body to suit piping system, and bronze or teflon disc.
 - 5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.
 - 6. Bronze Swing Check: Class 125, with rubber seat.
 - 7. Check Valves: Class 125, swing or wafer type as indicated.

- C. Chilled-Water Systems: Use the following valve types:
 - 1. Gate Valves: Class 150, bronze body; or Class 125, cast-iron body.
 - 2. Ball Valves: Class 150, 600-psi CWP, with stem extension and memory stop.
 - 3. Plug Valves: Buna N packing.
 - 4. Globe Valves: Class 125, bronze body with bronze or teflon disc; or Class 125, cast-iron body.
 - 5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM sleeve and stem seals.
 - 6. Check Valves: Class 125, bronze body swing check with rubber seat; Class 125, cast-iron body swing check; Class 125, cast-iron body wafer check; or Class 125, cast-iron body lift check.

3.8 ADJUSTING

- A. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION 15100

SECTION 15145 HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical systems piping and equipment.

1.3 DEFINITIONS

- A. Terminology used in this Section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

1.5 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure

Vessel Code," Section IX, "Welding and Brazing Qualifications."

- C. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
 - 1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
 - 1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
 - 2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36 (ASTM A 36M), steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, nonshrink, nonmetallic.
 - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is nonstaining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Water: Potable.
 - 4. Packaging: Premixed and factory-packaged.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.2 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- H. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- K. Insulated Piping: Comply with the following installation requirements.
 - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting

- through insulation; do not exceed pipe stresses allowed by ASME B31.9.
2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:

<u>NPS (Inches)</u>	<u>LENGTH (Inches)</u>	<u>THICKNESS (Inches)</u>
1/4 to 3-1/2	12	0.048
4	12	0.060
5 and 6	18	0.060
8 to 14	24	0.075
16 to 24	24	0.105

<u>PIPE SIZE (DN)</u>	<u>LENGTH (mm)</u>	<u>THICKNESS (mm)</u>
8 to 90	300	1.22
100	300	1.52
125 and 150	450	1.52
200 to 350	600	1.91
400 to 600	600	2.67

- (1) Pipes 8 Inches (DN 200) and Larger: Include wood inserts.
- (2) Insert Material: Length at least as long as the protective shield.
- (3) Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

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

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of 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 by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 15145

**SECTION 15150
SANITARY WASTE AND VENT 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. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
 - 3. Encasement for underground metal piping.

1.3 PERFORMANCE REQUIREMENTS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For sovent drainage system. Include plans, elevations, sections, and details.

1.5 INFORMATIONAL SUBMITTALS

- A. Storm Shelter Only: Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

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

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

- A. Pipe and Fittings: ASTM A 74, Service class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 - 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. ANACO-Husky.
 - b. Dallas Specialty & Mfg. Co.

- c. Fernco Inc.
- d. Matco-Norca, Inc.
- e. MIFAB, Inc.
- f. Mission Rubber Company; a division of MCP Industries, Inc.
- g. Stant.
- h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

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. ANACO-Husky.
 - b. Clamp-All Corp.
 - c. Dallas Specialty & Mfg. Co.
 - d. MIFAB, Inc.
 - e. Mission Rubber Company; a division of MCP Industries, Inc.
 - f. Stant.
 - g. Tyler Pipe.
2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings

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. MG Piping Products Company.
2. Standard: ASTM C 1277.
3. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Ductile-Iron, Push-on-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.
3. Gaskets: AWWA C111/A21.11, rubber.

C. Ductile-Iron, Grooved-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.
2. Ductile-Iron-Pipe Appurtenances:
 - 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) Anvil International.
 - 2) Shurjoint Piping Products.
 - 3) Star Pipe Products.
 - 4) Victaulic Company.
 - b. Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings with dimensions matching AWWA C110/A 21.10 ductile-iron pipe or AWWA C153/A 21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.
 - c. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

2.5 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
- D. Solvent Cement: ASTM D 2564.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Shielded, Nonpressure Transition Couplings:
 - 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) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.7 ENCASUREMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: high-density, cross-laminated polyethylene film of 0.004-inch minimum thickness.
- C. Form: Sheet or tub].
- D. Color: Black or natural.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 02300 "Earthwork."

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 coordination drawings.

- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Storm Shelter Only: Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 15073 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Install steel piping according to applicable plumbing code.
- P. Install aboveground PVC piping according to ASTM D 2665.
- Q. Install underground PVC piping according to ASTM D 2321.
- R. Install engineered soil and waste drainage and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
- S. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
- T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors.
- V. Install sleeve seals for piping penetrations of concrete walls and slabs.
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

- A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum calked joints.
- C. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- D. 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.
 - E. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.
 - F. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
 - G. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.
- 3.4 SPECIALTY PIPE FITTING INSTALLATION
- A. Transition Couplings:
 1. Install transition couplings at joints of piping with small differences in OD's.
 2. In Drainage Piping: Shielded, nonpressure transition couplings.
- 3.5 VALVE INSTALLATION
- A. General valve installation requirements are specified in Division 15 Section "Valves"
 - B. Shutoff Valves:
 1. Install gate or full-port ball valve for piping NPS 2 and smaller.
 2. Install gate valve for piping NPS 2-1/2 and larger.
- 3.6 HANGER AND SUPPORT INSTALLATION
- A. Storm Shelter Only: Comply with requirements for seismic-restraint devices specified in Section 15073 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
 - B. Comply with requirements for pipe hanger and support devices and installation specified in "Hangers and Supports."
 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

- c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2 : 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5 : 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every **15 feet**.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8-inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 - 3. NPS 2 : 10 feet with 3/8-inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 - 5. NPS 3: 12 feet with 1/2-inch rod.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
- I. Install supports for vertical steel piping every 15 feet.
- J. Install hangers for and PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- K. Install supports for vertical and PVC piping every 48 inches.
- L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

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

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 48 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Copper DWV tube, copper drainage fittings, and soldered joints.

4. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- E. Aboveground, vent piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
 3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
1. Service class, cast-iron soil piping;
 2. Hubless, cast-iron soil pipe and fittings; [CISPI] [heavy-duty] [cast-iron] hubless-piping couplings; and coupled joints.
 3. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:
1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; hubless-piping couplings; coupled joints.
 3. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.
 4. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 15150

SECTION 15170 MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes basic requirements for motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70, "National Electrical Code."
- B. NRTL Listing: Provide NRTL listed motors.
 - 1. Term "Listed": As defined in "National Electrical Code," Article 100.
 - 2. Listing Agency Qualifications: "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Comply with NEMA MG 1, "Motors and Generators."

PART 2 - PRODUCTS

2.1 MOTORS, GENERAL

- A. General: Requirements below apply to motors covered by this Section except as otherwise indicated.
- B. Motors 1/2 HP and Larger: Polyphase.
- C. Motors Smaller Than 1/2 HP: Single-phase.
- D. Frequency Rating: 60 Hz.
- E. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
 - 1. 120 V Circuit: 115 V - motor rating.

2. 208 V Circuit: 200 V - motor rating.
 3. 240 V Circuit: 230 V - motor rating.
- F. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
- G. Temperature Rise: Based on 40 deg C ambient except as otherwise indicated.
- H. Enclosure: Open dripproof.

2.2 POLYPHASE MOTORS

- A. General: Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated.
- B. NEMA Design Letter Designation: "B."
- C. Energy Efficient Motors: Nominal efficiency equal to or greater than that stated in NEMA MG 1, table 12-6B for that type and rating of motor.
- D. Internal Thermal Overload Protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
- E. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.
- F. Rugged Duty Motors: Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material. External finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.
- G. Motors for Reduced Inrush Starting: Coordinate with indicated reduced inrush controller type and with characteristics of driven equipment load. Provide required wiring leads in motor terminal box to suit control method.

2.3 SINGLE-PHASE MOTORS

- A. General: Conform to the following requirements except as otherwise indicated.
- B. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.
1. Permanent Split Capacitor.
 2. Split-Phase Start, Capacitor-Run.

3. Capacitor-Start, Capacitor-Run.
 - C. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.
 - D. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.
 - E. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: The following requirements apply to field-installed motors.
- B. Install motors in accordance with manufacturer's published instructions and the following:
 1. Direct Connected Motors: Mount securely in accurate alignment.
 2. Belt Drive Motors: Use adjustable motor mounting bases. Align pulleys and install belts. Use belts identified by the manufacturer and tension belts in accordance with manufacturer recommendations.

3.2 COMMISSIONING

- A. Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with the commissioning of the equipment for which the motor is a part.
- B. Report unusual conditions.
- C. Correct deficiencies of field-installed units.

END OF SECTION 15170

SECTION 15183 REFRIGERANT 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. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
 - 2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
 - 3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:
 - 1. Thermostatic expansion valves.
 - 2. Solenoid valves.
 - 3. Hot-gas bypass valves.
 - 4. Filter dryers.
 - 5. Strainers.
 - 6. Pressure-regulating valves.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Shop Drawing Scale: 1/4 inch equals 1 foot.
 - 2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.8 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.

1.9 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L or ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; Type, Grade, and wall thickness as selected in Part 3 piping applications articles.
- B. Wrought-Steel Fittings: ASTM A 234/A 234M, for welded joints.
- C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- D. Flexible Connectors:
 1. Body: Stainless-steel bellows with woven, flexible, stainless-steel-wire-reinforced protective jacket
 2. End Connections:
 - a. NPS 2 (DN 50) and Smaller: With threaded-end connections.
 - b. NPS 2-1/2 (DN 65) and Larger: With flanged-end connections.
 3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
 4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.3 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 3. Operator: Rising stem and hand wheel.
 4. Seat: Nylon.
 5. End Connections: Socket, union, or flanged.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 275 deg F (135 deg C).
- B. Packed-Angle Valves:
 1. Body and Bonnet: Forged brass or cast bronze.

2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig (3450 kPa).
8. Maximum Operating Temperature: 275 deg F (135 deg C).

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 275 deg F (135 deg C).

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and ac coil.
6. Working Pressure Rating: 400 psig (2760 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig (2760 kPa).
6. Maximum Operating Temperature: 240 deg F (116 deg C).

- G. Thermostatic Expansion Valves: Comply with ARI 750.
1. Body, Bonnet, and Seal Cap: Forged brass or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
 5. Suction Temperature: 40 deg F.
 6. Superheat: Adjustable.
 7. Reverse-flow option (for heat-pump applications).
 8. End Connections: Socket, flare, or threaded union.
 9. Working Pressure Rating: 700 psig.
- H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.
1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
 2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
 3. Packing and Gaskets: Non-asbestos.
 4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
 5. Seat: Polytetrafluoroethylene.
 6. Equalizer: Internal.
 7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch (16-GRC) conduit adapter, and ac coil.
 8. End Connections: Socket.
 9. Throttling Range: Maximum 5 psig (34 kPa).
 10. Working Pressure Rating: 500 psig (3450 kPa).
 11. Maximum Operating Temperature: 240 deg F (116 deg C).
- I. Straight-Type Strainers:
1. Body: Welded steel with corrosion-resistant coating.
 2. Screen: 100-mesh stainless steel.
 3. End Connections: Socket or flare.
 4. Working Pressure Rating: 500 psig (3450 kPa).
 5. Maximum Operating Temperature: 275 deg F (135 deg C).
- J. Angle-Type Strainers:
1. Body: Forged brass or cast bronze.
 2. Drain Plug: Brass hex plug.
 3. Screen: 100-mesh monel.
 4. End Connections: Socket or flare.
 5. Working Pressure Rating: 500 psig (3450 kPa).
 6. Maximum Operating Temperature: 275 deg F (135 deg C).
- K. Moisture/Liquid Indicators:
1. Body: Forged brass.
 2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.

3. Indicator: Color coded to show moisture content in ppm.
 4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
 5. End Connections: Socket or flare.
 6. Working Pressure Rating: 500 psig (3450 kPa).
 7. Maximum Operating Temperature: 240 deg F (116 deg C).
- L. Replaceable-Core Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Rated Flow: Based upon HVAC tons of refrigeration.
 9. Working Pressure Rating: 500 psig (3450 kPa).
 10. Maximum Operating Temperature: 240 deg F (116 deg C).
- M. Permanent Filter Dryers: Comply with ARI 730.
1. Body and Cover: Painted-steel shell.
 2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
 3. Desiccant Media: Activated alumina.
 4. Designed for reverse flow (for heat-pump applications).
 5. End Connections: Socket.
 6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
 7. Maximum Pressure Loss: 2 psig.
 8. Rated Flow: Based upon HVAC tons of refrigeration.
 9. Working Pressure Rating: 500 psig (3450 kPa).
 10. Maximum Operating Temperature: 240 deg F (116 deg C).
- N. Mufflers:
1. Body: Welded steel with corrosion-resistant coating.
 2. End Connections: Socket or flare.
 3. Working Pressure Rating: 500 psig (3450 kPa).
 4. Maximum Operating Temperature: 275 deg F (135 deg C).
- O. Receivers: Comply with ARI 495.
1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
 2. Comply with UL 207; listed and labeled by an NRTL.
 3. Body: Welded steel with corrosion-resistant coating.
 4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.

5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 275 deg F (135 deg C).

P. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.4 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:
1. Atofina Chemicals, Inc.
 2. DuPont Company; Fluorochemicals Div.
 3. Honeywell, Inc.; Genetron Refrigerants.
 4. INEOS Fluor Americas LLC.
- C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
- B. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- C. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.
- D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 3. NPS 1-1/4 (DN 32) and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
 4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- F. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications NPS 2 to NPS 4 (DN 50 to DN 100): Schedule 40, black-steel and wrought-steel fittings with welded joints.
- G. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- H. Safety-Relief-Valve Discharge Piping: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
- I. Safety-Relief-Valve Discharge Piping:
1. NPS 5/8 and Smaller: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 2. NPS 3/4 to NPS 1 and Smaller: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
 3. NPS 1-1/4 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.
 4. NPS 1-1/2 to NPS 2: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.
- J. Safety-Relief-Valve Discharge Piping NPS 2 to NPS 4: Schedule 40, black-steel and wrought-steel fittings with welded joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Solenoid valves.
 - 2. Thermostatic expansion valves.
 - 3. Hot-gas bypass valves.
 - 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install receivers sized to accommodate pump-down charge.
- M. Install flexible connectors at compressors.

3.3 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. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.
- L. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- M. 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.
 - 4. Liquid lines may be installed level.
- N. 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.
- O. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- P. Identify refrigerant piping and valves.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

- E. 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 BAg, cadmium-free silver alloy for joining copper with bronze or steel.

- F. Threaded Joints: Thread steel 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.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Section 15062 "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 (6 m) long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) 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 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
 - 4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
 - 6. NPS 2 (DN 50): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

7. NPS 2-1/2 (DN 65): Maximum span, 108 inches (2700 mm); minimum rod size, 3/8 inch (9.5 mm).
8. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (9.5 mm).
9. NPS 4 (DN 100): Maximum span, 12 feet (3.7 m); minimum rod size, 1/2 inch (13 mm).

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.8 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. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. 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 15183

SECTION 15250 MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes pipe, duct, and equipment insulation.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 15 Section "Supports and Anchors" for pipe insulation shields and protection saddles.
 - 2. Division 15 Section "Metal Ductwork" for duct lining.

1.3 DEFINITIONS

- A. Hot Surfaces: Normal operating temperatures of 100 deg F (38 deg C) or higher.
- B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
- C. Cold Surfaces: Normal operating temperatures less than 75 deg F (24 deg C).
- D. Thermal resistivity is designated by an r-value that represents the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch (25.4 mm) thick. Thermal resistivity (r-value) is expressed by the temperature difference in degrees Fahrenheit (Kelvins) between the two exposed faces required to cause 1 BTU per hour (1 Watt) to flow through 1 square foot (1 square meter) at mean temperatures indicated.
- E. Thermal Conductivity (k-value): Measure of heat flow through a material at a given temperature difference; conductivity is expressed in units of Btu x inch/h x sq. ft. x deg F (W x m/sq. m x K).
- F. Density: Is expressed in pcf (kg/cu. m).

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of mechanical insulation identifying k-value, thickness, and

accessories.

1.5 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
 - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
 - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.6 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping and duct systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Glass Fiber:
 - a. CertainTeed Corporation.
 - b. Knauf Fiberglass GmbH.
 - c. Manville.
 - d. Owens-Corning Fiberglas Corporation.
 - e. USG Interiors, Inc. - Thermafiber Division.
 - 2. Flexible Elastomeric Cellular:
 - a. Armstrong World Industries, Inc.
 - b. Halstead Industrial Products.
 - c. IMCOA.
 - d. Rubatex Corporation.

2.2 GLASS FIBER

- A. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All-purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

- C. Board: ASTM C 612, Class 2, semi-rigid jacketed board.
 - 1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F (0.037 W x m/sq. m x K) average maximum, at 75 deg F (24 deg C) mean temperature.
 - 2. Density: 12 pcf (192 kg/cu. m) average maximum.
- D. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets.
 - 1. Thermal Conductivity: 0.32 Btu x inch/h x sq. ft. x deg F (0.046 W x m/sq. m x K) average maximum, at 75 deg F (24 deg C) mean temperature.
- E. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.
 - 1. Thermal Conductivity: 0.26 Btu x inch/h x sq. ft. x deg F (0.037 W x m/sq. m x K) average maximum at 75 deg F (24 deg C) mean temperature.
 - 2. Density: 10 pcf (160 kg/cu. m) average maximum.
- F. Adhesive: Produced under the UL Classification and Follow-up service.
 - 1. Type: Non-flammable, solvent-based.
 - 2. Service Temperature Range: Minus 20 to 180 deg F (Minus 29 to 82 deg C).
- G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
 - 1. Tubular Materials: ASTM C 534, Type I.
 - 2. Sheet Materials: ASTM C 534, Type II.
- B. Thermal Conductivity: 0.30 Btu x inch/h x sq. ft. x deg F (0.043 W x m/sq. m x K) average maximum at 75 deg F (24 deg C).
- C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.
- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
 - 1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.5 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per sq. yd. (272 gm per sq. m).
 1. Tape Width: 4 inches (102 mm).
 2. Cloth Standard: MIL-C-20079H, Type I.
 3. Tape Standard: MIL-C-20079H, Type II.
- B. Bands: 3/4 inch (19 mm) wide, in one of the following materials compatible with jacket:
 1. Stainless Steel: Type 304, 0.020 inch (0.5 mm) thick.
 2. Galvanized Steel: 0.005 inch (0.13 mm) thick.
 3. Aluminum: 0.007 inch (0.18 mm) thick.
 4. Brass: 0.01 inch (0.25 mm) thick.
 5. Nickel-Copper Alloy: 0.005 inch (0.13 mm) thick.
- C. Wire: 14 gage (1.6 mm) nickel copper alloy, 16 gage (1.6 mm), soft-annealed stainless steel, or 16 gage (1.6 mm), soft-annealed galvanized steel.
- D. Corner Angles: 28 gage (0.3 mm), 1 inch by 1 inch (25 mm by 25 mm) aluminum, adhered to 2 inches by 2 inches (50 mm by 50 mm) kraft paper.
- E. Anchor Pins: Capable of supporting 20 pounds (9 kg) each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.6 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition.
 1. Water Vapor Permeance: 0.08 perm (4.6 ng/Pa/s/sq. m) maximum.
 2. Temperature Range: Minus 20 to 180 deg F (Minus 29 to 82 deg C).
- B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
 1. Water Vapor Permeance: 0.02 perm (1.2 ng/Pa/s/sq. m) maximum.
 2. Temperature Range: Minus 50 to 250 deg F (Minus 46 to 121 deg C).
 3. Color: Aluminum.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

- B. Mix insulating cements with clean potable water. Mix insulating cements contacting stainless-steel surfaces with demineralized water.

- 1. Follow cement manufacturer's printed instructions for mixing and portions.

3.2 INSTALLATION, GENERAL

- A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.
- B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F (16 deg C).
- D. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- E. Install insulation with smooth, straight, and even surfaces.
- F. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
- G. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
- H. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.
- I. Apply adhesives and coatings at manufacturer's recommended coverage-per-gallon rate.
- J. Keep insulation materials dry during application and finishing.
- K. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
 - 1. Fibrous glass ducts.
 - 2. Metal ducts with duct liner.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 - 5. Flexible connectors for ducts and pipes.
 - 6. Vibration control devices.
 - 7. Testing laboratory labels and stamps.
 - 8. Nameplates and data plates.
 - 9. Access panels and doors in air distribution systems.
 - 10. Sanitary drainage and vent piping.

11. Drainage piping located in crawl spaces, unless indicated otherwise.
12. Below grade piping.
13. Chrome-plated pipes and fittings, except for plumbing fixtures for the disabled.
14. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL

- A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
- B. Stagger joints on double layers of insulation.
- C. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated.
- D. Apply insulation with a minimum number of joints.
- E. Apply insulation with integral jackets as follows:
 1. Pull jacket tight and smooth.
 2. Cover circumferential joints with butt strips, at least 3 inches (76 mm) wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches (100 mm) on center.
 3. Longitudinal Seams: Overlap seams at least 1-1/2 inches (40 mm). Apply 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 4 inches (100 mm) on center.
 - a. Exception: Do not staple longitudinal laps on insulation applied to piping systems with surface temperatures at or below 35 deg F (1.7 deg C).
 4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
 6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches (50 mm) in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.
- F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.
- G. Exterior Wall Penetrations: For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor barrier coating.

- H. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches (50 mm) from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer.
- I. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer.
- J. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.
- K. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
 - 1. Use same material and thickness as adjacent pipe insulation.
 - 2. Overlap nesting insulation by 2 inches (50 mm) or 1-pipe diameter, whichever is greater.
 - 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
 - 4. Insulate elbows and tees smaller than 3 inches (DN 75) pipe size with premolded insulation.
 - 5. Insulate elbows and tees 3 inches (DN 75) and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.
 - 6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
- L. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 15 Section "Supports and Anchors." For cold surface piping, extend insulation on anchor legs a minimum of 12 inches (300 mm) and taper and seal insulation ends.
 - 1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
 - 1. Miter cut materials to cover soldered elbows and tees.
 - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.5 FLEXIBLE ELASTOMERIC CELLULAR EQUIPMENT INSULATION INSTALLATION

- A. Install sheets of the largest manageable size.
- B. Apply full coverage of adhesive to the surfaces of the equipment and to the insulation.
- C. Butt insulation joints firmly together and apply adhesive to insulation edges at joints.

3.6 DUCT INSULATION

- A. Install block and board insulation as follows:
 - 1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches (300 mm) apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
 - 2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches (450 mm) apart each way and 3 inches (75 mm) from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.
- B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
 - 1. Smaller Than 24 Inches (610 mm): Bonding adhesive applied in 6 inches (150 mm) wide transverse strips on 12 inches (300 mm) centers.
 - 2. 24 Inches (610 mm) and Larger: Anchor pins spaced 12 inches (300 mm) apart each way. Apply bonding adhesive to prevent sagging of the insulation.
 - 3. Overlap joints 3 inches (75 mm).
 - 4. Seal joints, breaks, and punctures with vapor barrier compound.

3.7 JACKETS

- A. Foil and Paper Jackets (FP): Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inches (40 mm) laps at longitudinal joints and 3 inch (75 mm) wide butt strips at end joints.
 - 1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
- B. Exterior Exposed Insulation: Install continuous aluminum jackets and seal all joints and seams with waterproof sealant.
- C. Install metal jacket with 2 inches (50 mm) overlap at longitudinal and butt joints. Overlap longitudinal joints to shed water. Seal butt joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel draw bands 12 inches (300 mm) on center and at butt joints.
- D. Install the PVC jacket with 1 inch (25 mm) overlap at longitudinal and butt joints and seal with

adhesive.

- E. Install glass cloth jacket directly over insulation. On insulation with a factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2 inch (50 mm) overlap at joints. Embed glass cloth between (2) 1/16 inch (1.6 mm) thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

3.8 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.9 APPLICATIONS

- A. General: Materials and thicknesses are specified in schedules at the end of this Section.
- B. Interior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Refrigerant suction.
 - 2. Condensate.
- C. Interior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Refrigerant suction.
 - 2. Condensate.
- D. Exterior, Exposed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Domestic cold water.
 - 2. Storm water.
 - 3. Refrigerant suction.
 - 4. Condensate.
- E. Exterior, Concealed Piping Systems: Unless otherwise indicated, insulate the following piping systems:
 - 1. Condensate Drains.
 - 2. Refrigerant suction.
- F. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
 - 1. Interior concealed supply, return and outside air ductwork.
 - 2. Interior exposed supply, return and outside air ductwork.
 - 3. Exterior exposed supply and return ductwork.
 - 4. Interior exposed and concealed supply fans, air handling unit casings and outside air

plenums.

3.10 PIPE INSULATION SCHEDULES

- A. General: Abbreviations used in the following schedules include:
1. Field-Applied Jackets: P - PVC, K - Foil and Paper, A - Aluminum, SS - Stainless Steel.
 2. Pipe Sizes: NPS - Nominal Pipe Size (DN - Nominal Dimension).
- B. Domestic Cold Water, Condensate, and Storm Water All Sizes (Interior): 1/2 inch (13 mm) thick glass fiber, cellular glass, or flexible elastomeric insulation. Field-applied jacket is not required.

INTERIOR DOMESTIC HOT WATER

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	1	NO	NONE
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1	NO	NONE

INTERIOR REFRIGERANT SUCTION EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	3/4	YES	NONE
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	3/4	YES	NONE

EXTERIOR REFRIGERANT SUCTION EXPOSED AND CONCEALED

<u>PIPE SIZES (NPS)</u>	<u>MATERIALS</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	3/4	YES	NONE
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	3/4	YES	NONE

3.11 DUCT SYSTEMS INSULATION SCHEDULE

REFERNCE DRAWINGS, SHEET M1.1, HVAC NOTES FOR THICKNESS, TYPE, ETC.

<u>MATERIAL</u>	<u>FORM</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
REF DWGS	REF DWGS	REF DWGS	YES	NONE

INTERIOR EXPOSED HVAC SUPPLY AND RETURN DUCTS AND PLENUMS

REFERNCE DRAWINGS, SHEET M1.1, HVAC NOTES FOR THICKNESS, TYPE, ETC.

<u>MATERIAL</u>	<u>FORM</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
REF DWGS	REF DWGS	REF DWGS	YES	NONE

INTERIOR EXPOSED HVAC SUPPLY FANS, AIR HANDLING UNITS, CASING, AND PLENUMS

<u>MATERIAL</u>	<u>FORM</u>	<u>THICKNESS IN INCHES</u>	<u>VAPOR BARRIER REQ'D</u>	<u>FIELD- APPLIED JACKET</u>
GLASS FIBER	BOARD	2	YES	NONE

END OF SECTION 15250

SECTION 15411 WATER DISTRIBUTION PIPING

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 water distribution piping from locations indicated to fixtures and equipment inside building.

1.3 DEFINITIONS

- A. Water Service Piping: Water piping outside building that conveys water to building.
- B. Service Entrance Piping: Water piping at entry into building between water service piping and water distribution piping.
- C. Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.
- D. The following are industry abbreviations for plastic piping materials:
 - 1. PVC: Polyvinyl chloride.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Combined Fire-Protection and Domestic, Service Entrance Piping: 250 psig.
 - 2. Service Entrance Piping: 160 psig.
 - 3. Water Distribution Piping: 125 psig.

1.5 SUBMITTALS

- A. Water Samples, Test Results, and Reports: Specified in "Field Quality Control" and "Cleaning" articles.

1.6 QUALITY ASSURANCE

- A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.
- B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic potable-water piping components. Include marking "NSF-pw" on plastic potable-water piping.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.
- C. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
- D. Ductile-Iron Pipe: AWWA C151, 250-psig minimum pressure rating with mechanical- or push-on-joint bell, plain spigot end, and AWWA C104 cement-mortar lining. Include AWWA C111 ductile-iron gland, rubber gasket, and steel bolts with mechanical-joint pipe. Include AWWA C111 rubber gasket with push-on-joint pipe.
- E. Galvanized Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40.
- F. Galvanized, Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless, steel pipe.
- G. PVC Plastic Pipe: ASTM D 1785, Schedules 40 and 80.

2.2 PIPE AND TUBE FITTINGS

- A. Copper, Solder-Joint Pressure Fittings: ASME B16.18 cast-copper alloy or ASME B16.22 wrought copper.
- B. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

- D. Copper Unions: ASME B16.18, cast-copper-alloy, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.
- E. Ductile-Iron, Mechanical- or Push-on-Joint Fittings: AWWA C110, ductile- or gray-iron standard pattern; or AWWA C153, ductile-iron compact pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining. Include AWWA C111 ductile- or gray-iron glands, rubber gaskets, and steel bolts with mechanical-joint fittings. Include AWWA C111 rubber gaskets with push-on-joint fittings.
- F. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends conforming to AWWA C110 or AWWA C153. Include 2 gasketed ball-joint sections, 1 or more gasketed sleeve sections, 250-psig minimum working-pressure rating, and AWWA C550 epoxy interior coating. Assemble components for offset and expansion indicated. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.
- G. Ductile-Iron Deflection Fittings: Compound coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends conforming to AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating and AWWA C104 cement-mortar lining or AWWA C550 epoxy interior coating. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.
- H. Ductile-Iron Expansion Joints: 3-piece assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections conforming to AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating and AWWA C104 cement-mortar lining or AWWA C550 epoxy interior coating. Select and assemble components for expansion indicated. Include AWWA C111 ductile-iron glands, rubber gaskets, and steel bolts.
- I. Ductile-Iron Flanged Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining.
- J. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends with threads according to ASME B1.20.1. Furnish Class 300 unions if required to match piping.
- K. Cast-Iron, Threaded Flanges: ASME B16.1, Class 125. Furnish Class 250 flanges if required to match piping.
- L. Schedule 40, PVC Socket Fittings: ASTM D 2466.

2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.

- B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.
- C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.
- D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.
- E. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.4 POLYETHYLENE ENCASEMENT

- A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105 polyethylene film, 0.008-inch minimum thickness, tube or sheet.

2.5 VALVES:

- A. Refer to Division 15 Section "Valves" for general-duty valves.
- B. Refer to Division 15 Section "Plumbing Specialties" for special-duty valves.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
- D. Underground, Service Entrance Piping: Do not use flanges or valves underground. Use the following:
 - 1. 4- to 8-Inch NPS: Ductile-iron pipe and fittings, and mechanical or push-on joints.
- E. Aboveground, Water Distribution Piping: Use the following:
 - 1. 1-1/2-Inch NPS and Smaller: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 2. 2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 3. 2-1/2- to 3-1/2-Inch NPS: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.
 - 4. 4- to 6-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.
 - 5. 8-Inch NPS: Flanged, ductile-iron pipe and flanged, ductile-iron fittings.

F. Underground, Water Distribution Piping: Do not use flanges or valves underground. Use the following:

1. 2-Inch NPS and Smaller: Soft copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.
2. 2-1/2- to 4-Inch NPS: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate, ball, or butterfly valves.
2. Throttling Duty: Use globe, ball, or butterfly valves.

B. Grooved-end butterfly valves may be used with grooved-end piping.

3.3 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.4 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each service entrance pipe.

C. Install water-pressure regulators downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators.

D. Ductile-Iron, Service Entrance Piping: Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service piping with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.

1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

- F. Install wall penetration system at each service entrance pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

3.5 WATER DISTRIBUTION PIPING INSTALLATION

- A. Install piping level without pitch.
- B. Fitting Option for Hard Copper Tube: Mechanically formed tee-branch outlets may be used instead of tee fittings.

3.6 JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Mechanically Formed Outlets: Form tee in copper tube according to equipment manufacturer's written instructions. Use tool designed for copper tube, drill pilot hole, form collar for outlet, dimple tube forming seating stop, and braze branch tube into collar.
- C. Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.7 ROUGHING-IN FOR WATER METERS

- A. Rough-in water piping and install water meters according to utility company's requirements. Water meters will be furnished by utility.

3.8 VALVE INSTALLATION

- A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
- B. Shutoff Valves: Install shutoff valve on each water supply to equipment, on each supply to plumbing fixtures without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.
- C. Drain Valves: Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
 - 1. Install hose-end drain valves at low points in water mains, risers, and branches.
 - 2. Install stop-and-waste drain valves where indicated.

3.9 HANGER AND SUPPORT INSTALLATION

- A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:
1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.
 2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.
 3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs longer than 100 feet.
 4. Spring cushion rolls, MSS Type 49, if indicated, for individual, straight, horizontal runs longer than 100 feet.
 5. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs 100 feet or longer. Support pipe rolls on trapeze.
 6. Spring hangers, MSS Type 52, for supporting base of vertical runs.
- B. Install supports according to Division 15 Section "Hangers and Supports."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. 3/4-Inch NPS and Smaller: Maximum horizontal spacing, 60 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 2. 1-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 3. 1-1/4-Inch NPS: Maximum horizontal spacing, 72 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 4. 1-1/2 and 2-Inch NPS: Maximum horizontal spacing, 96 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 5. 2-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 6. 3-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 7. 3-1/2-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 8. 4- and 5-Inch NPS: Maximum horizontal spacing, 10 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 9. 6-Inch NPS: Maximum horizontal spacing, 10 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 10 feet.
 10. 8-Inch NPS: Maximum horizontal spacing, 10 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 10 feet.
- F. Install hangers for steel and ductile-iron piping with the following maximum spacing and minimum rod diameters:

1. 1-1/4-Inch NPS and Smaller: Maximum horizontal spacing, 84 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
2. 1-1/2-Inch NPS: Maximum horizontal spacing, 108 inches with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
3. 2-Inch NPS: Maximum horizontal spacing, 10 feet with 3/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
4. 2-1/2-Inch NPS: Maximum horizontal spacing, 11 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
5. 3- and 3-1/2-Inch NPS: Maximum horizontal spacing, 12 feet with 1/2-inch minimum rod diameter; maximum vertical spacing, 15 feet.
6. 4- and 5-Inch NPS: Maximum horizontal spacing, 12 feet with 5/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.
7. 6-Inch NPS: Maximum horizontal spacing, 12 feet with 3/4-inch minimum rod diameter; maximum vertical spacing, 15 feet.
8. 8- through 12-Inch NPS: Maximum horizontal spacing, 12 feet with 7/8-inch minimum rod diameter; maximum vertical spacing, 15 feet.

- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

- A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:
1. Booster Systems: Connect cold-water suction and discharge piping.
 2. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 3. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
 4. Equipment: Connect hot- and cold-water supply piping as indicated. Provide shutoff valve and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

3.11 FIELD QUALITY CONTROL

- A. Inspect service entrance piping and water distribution piping as follows:
1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

- a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test service entrance piping and water distribution piping as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
 3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
 4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 5. Prepare reports for tests and required corrective action.

3.12 CLEANING

- A. Clean and disinfect potable service entrance piping and water distribution piping as follows:
1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 1. Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 2. Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.
 - c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.

- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.
- B. Prepare and submit reports for purging and disinfecting activities.
- C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 COMMISSIONING

- A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.
- B. Perform the following steps before putting into operation:
 - 1. Close drain valves, hydrants, and hose bibbs.
 - 2. Open shutoff valves to fully open position.
 - 3. Open throttling valves to proper setting.
 - 4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
 - 5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 - 6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.
- C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
- D. Check plumbing specialties and verify proper settings, adjustments, and operation.
 - 1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.
- E. Energize pumps and verify proper operation.

END OF SECTION 15411

SECTION 15430 PLUMBING SPECIALTIES

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 plumbing specialties for water distribution systems; soil, waste, and vent systems; and storm drainage systems.
- B. Products installed but not furnished under this Section include water meters that will be furnished by the utility company to the site and ready for installation.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working pressure ratings, except where otherwise indicated:
 - 1. Water Distribution Systems, Below Ground: 150 psig.
 - 2. Water Distribution Systems, Above Ground: 125 psig.
 - 3. Soil, Waste, and Vent Systems: 10 foot head of water.
 - 4. Storm Drainage Systems: 10 foot head of water.
 - 5. Sanitary Sewage, Pumped Piping Systems: 75 psig.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
 - 1. Backflow preventers.
 - 2. Water pressure regulators.
 - 3. Strainers.
 - 4. Hose bibbs, wall hydrants, and post and sanitary hydrants.
 - 5. Drain valves.

6. Water hammer arresters.
7. Trap seal primer valves.
8. Cleanouts, cover plates, and access panels.
9. Floor drains, open receptors, trench drains, and roof drains.
10. Sleeve penetration systems.

C. Maintenance data for inclusion in Operating and Maintenance manuals as specified in Division 1 Section "Project Closeout" for the following:

1. Backflow preventers.
2. Water pressure regulators.
3. Backwater valves.
4. Grease interceptors, grease recovery units, oil interceptors and oil storage tanks, and solids interceptors.

1.5 QUALITY ASSURANCE

- A. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
- B. Electrical Component Standard: NFPA 70, "National Electrical Code."
- C. Listing and Labeling: Provide equipment that is listed and labeled.
 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Design Concept: The Drawings indicate capacities, sizes, and dimensional requirements of system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality of products is on the Contractor. Refer to Division 1 Section "Product Substitutions."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 1. Backflow Preventers:
 - a. Ames Co., Inc.
 - b. Cash by A.W. Cash Valve Mfg. Corp.
 - c. Cla-Val Co.
 - d. Conbraco Industries, Inc.

- e. Febco.
 - f. Hersey Products, Inc., Grinnell Corp.
 - g. Sparco, Inc.
 - h. Watts Regulator Co.
 - i. Wilkins Regulator Div., Zurn Industries, Inc.
2. Water Pressure Regulators:
- a. Bermad.
 - b. Cash by A.W. Cash Valve Mfg. Corp.
 - c. Cla-Val Co.
 - d. Conbraco Industries, Inc.
 - e. G A Industries, Inc.
 - f. Honeywell Braukmann.
 - g. Keckley by O.C. Keckley Co.
 - h. Spence Engineering Co., Inc.
 - i. Watts Regulator Co.
 - j. Wilkins Regulator Div., Zurn Industries, Inc.
3. Wall Hydrants and Post Hydrants:
- a. Ancon, Inc.
 - b. Jones Manufacturing Co., Inc.
 - c. Josam Co.
 - d. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
 - e. Wade Div., Tyler Pipe.
 - f. Watts Regulator Co.
 - g. Woodford Manufacturing Co. Div., WCM Industries, Inc.
 - h. Zurn by Hydromechanics Div., Zurn Industries, Inc.
4. Water Hammer Arresters:
- a. Amtrol, Inc.
 - b. Ancon, Inc.
 - c. Jones Manufacturing Co., Inc.
 - d. Josam Co.
 - e. Precision Plumbing Products, Inc.
 - f. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
 - g. Sioux Chief Manufacturing Co., Inc.
 - h. Wade Div., Tyler Pipe.
 - i. Watts Regulator Co.
 - j. Zurn by Hydromechanics Div., Zurn Industries, Inc.
5. Trap Seal Primer Valves:
- a. Ancon, Inc.
 - b. Jones Manufacturing Co., Inc.
 - c. Josam Co.
 - d. Wade Div., Tyler Pipe.

- e. Watts Regulator Co.
 - f. Zurn by Hydromechanics Div., Zurn Industries, Inc.
6. Sleeve Penetration Systems:
- a. Proset Systems, Inc.

2.2 BACKFLOW PREVENTERS

- A. General: ASSE Standard, backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.
- 1. Working Pressure: 150 psig minimum except where indicated otherwise.
 - 2. 2 Inches and Smaller: Bronze body with threaded ends.
 - 3. 2-1/2 Inches and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
 - a. Interior Lining: FDA-approved epoxy coating, for backflow preventers having cast-iron or steel body.
 - 4. Interior Components: Corrosion-resistant materials.
 - 5. Exterior Finish: Polished chrome plate when used in chrome-plated piping system.
 - 6. Strainer on inlet, where strainer is indicated.
- B. Hose Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- C. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, consisting of (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.
- 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
- D. Double-Check Backflow Prevention Assemblies: ASSE 1015, consisting of shutoff valves on inlet and outlet and strainer on inlet. Include test cocks with 2 positive-seating check valves for continuous pressure application.
- 1. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

2.3 WATER PRESSURE REGULATORS

- A. General: ASSE 1003, water pressure regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y type strainer.

1. 2 Inches and Smaller: Bronze body with threaded ends.
2. Interior Components: Corrosion-resistant materials.
3. Exterior Finish: Polished chrome plate when used in chrome plated piping system.

2.4 MISCELLANEOUS PIPING SPECIALTIES

- A. Piping specialties such as escutcheons, dielectric fittings, sleeves, and sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Strainers: Y pattern, except where otherwise indicated, full size of connecting piping. Include Type 304 stainless-steel screens with 3/64-inch perforations except where other screens are indicated.
1. Pressure Rating: 125 psig minimum steam working pressure except where otherwise indicated.
 2. Sizes 2 Inches and Smaller: Bronze body, with female threaded ends.
 3. Sizes 2-1/2 Inches and Larger: Cast-iron body, with interior FDA-approved epoxy coating and flanged ends.
 4. Y-Type Strainers: Screwed screen retainer with centered blowdown.
 - a. Drain: Pipe plug.
- C. Hose Bibbs: Bronze body, with renewable composition disc, 1/2 or 3/4 inch threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.
1. Finish: Rough brass.
 2. Operation: Operating key (handle). Provide 1 operating key.
- D. Wall Hydrants: ASME A112.21.3M or ASSE 1019, nonfreeze, automatic draining, antibackflow type, key operation, with 3/4 or 1 inch threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Provide 1 operating key.
1. Type: Recessed.
 2. Finish: Nickel bronze.
- E. Post Hydrants: ASME A112.21.3M, nonfreeze, bronze casing, cast-iron or cast-aluminum casing guard, key operation. Provide 1 operating key.
1. Inlet: 3/4 or 1 inch threaded.
 2. Outlet: Integral or field-installed, nonremovable and drainable hose-connection vacuum breaker, with outlet conforming to ASME B1.20.7 for garden-hose thread, and tapped drain port in valve housing.
 3. Length: As required for installing inlet valve below frost line.
- F. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes "A" through "F" and PDI WH-201 sizes "A" through "F."

- G. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. 125 psig minimum working pressure.
 2. Bronze body with atmospheric-vented drain chamber.
 3. Inlet and Outlet Connections: 1/2 inch threaded, union, or solder joint.
 4. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.5 CLEANOUTS

- A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

2.6 FLOOR DRAINS

- A. General: Size outlets as indicated on Product Data Sheet or drawings.
- B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. See Product Data Sheet at end of Part 3 of this Section for shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features.
- C. Open Drains: Shop- or field-fabricate from ASTM A 74, Service Class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P trap, hub-and-spigot riser section of length to provide depth indicated, and where indicated increaser fitting of size indicated, joined with ASTM C 564 neoprene gaskets. Size P trap as indicated on drawings.
- D. Deep Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.
1. 2 Inches Size: 4 inches minimum water seal.
 2. 2-1/2 Inches and Larger: 5 inches minimum water seal.
- E. Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.
- F. Air Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.

2.7 SLEEVE PENETRATION SYSTEMS

- A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
 - 1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on 1 end for installation in cast-in-place concrete slabs.

PART 3 - EXECUTION

3.1 PIPING SPECIALTY INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated, at each water supply connection to mechanical equipment and systems, and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.
- B. Install strainers on supply side of each control valve, pressure-regulating valve, and solenoid valve, and where indicated.
- C. Install hose bibbs with integral or field-installed vacuum breaker.
- D. Install wall hydrants with integral or field-installed vacuum breaker.
- E. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.
- F. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
 - 1. Size same as drainage piping up to 4 inches size. Use 4 inches size for larger drainage piping except where larger size cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
 - 3. Locate at minimum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping.
 - 4. Locate at base of each vertical soil or waste stack.
- G. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
- H. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- I. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.

- J. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer's written instructions.

3.2 FLOOR DRAIN INSTALLATION

- A. Install floor drains according to manufacturer's written instructions, in locations indicated.
- B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- C. Set drain elevation depressed below finished slab elevation as listed below to provide proper floor slope to drain:
 - 1. 60 inches Drain Area Radius: 1/2 inch depression.
 - 2. 10 Foot Drain Area Radius: 3/4 inch depression.
 - 3. 15 Foot Drain Area Radius: 1 inch depression.
 - 4. 20 Foot Drain Area Radius: 1-1/4 inches depression.
 - 5. 25 Foot Drain Area Radius: 1-1/2 inches depression.
- D. Trap drains connected to sanitary building drain.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- F. Position drains for easy accessibility and maintenance.

3.3 CONNECTIONS

- A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts to fixtures of sizes indicated, but not smaller than required by plumbing code.
- B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.
- C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
- D. Interceptor Connections: Connect piping, flow control fittings, and accessories as indicated.

3.4 COMMISSIONING

- A. Preparation: Perform the following checks before start-up:
 - 1. Systems tests are complete.
 - 2. Damaged and defective specialties and accessories have been replaced or repaired.

3. There is clear space for servicing of specialties.

B. Before operating systems, perform these steps:

1. Close drain valves, hydrants, and hose bibbs.
2. Open valves to full open position.
3. Remove and clean strainers.
4. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.

3.5 ADJUSTING

A. Adjust operation and correct deficiencies discovered during commissioning.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel on procedures related to startup and servicing of interceptors.

3.7 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION 15430

SECTION 15440 PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 15 Sections apply to this Section:
 - 1. "Basic Mechanical Requirements."
 - 2. "Basic Mechanical Materials and Methods."

1.2 SUMMARY

- A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.
- B. Products installed but not furnished under this Section include:
 - 1. Owner-supplied fixtures, as indicated.
 - 2. Accessories, appliances, appurtenances, and equipment specified in other sections, requiring plumbing services or fixture-related devices, as indicated.

1.3 DEFINITIONS

- A. Accessible: Describes a plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped people.
- B. Accessory: Device that adds effectiveness, convenience, or improved appearance to a fixture but is not essential to its operation.
- C. Appliance: Device or machine designed and intended to perform a specific function.
- D. Appurtenance: Device or assembly designed to perform some useful function when attached to or used with a fixture.
- E. Equipment: Device used with plumbing fixtures or plumbing systems to perform a certain function for plumbing fixtures but that is not part of the fixture.
- F. Fitting: Fitting installed on or attached to a fixture to control the flow of water into or out of the fixture.

- G. Fixture: Installed receptor connected to the water distribution system, that receives and makes available potable water and discharges the used liquid or liquid-borne wastes directly or indirectly into the drainage system. The term "Fixture" means the actual receptor, except when used in a general application where terms "Fixture" and "Plumbing Fixture" include associated trim, fittings, accessories, appliances, appurtenances, support, and equipment.
- H. Roughing-In: Installation of piping and support for the fixture prior to the actual installation of the fixture.
- I. Support: Device normally concealed in building construction, for supporting and securing plumbing fixtures to walls and structural members. Supports for urinals, lavatories, and sinks are made in types suitable for fixture construction and the mounting required. Categories of supports are:
 - 1. Carrier: Floor-mounted support for wall-mounted water closet, and support fixed to wall construction for wall-hung fixture.
 - 2. Chair Carrier: Support for wall-hung fixture, having steel pipe uprights that transfer weight to the floor.
 - 3. Chair Carrier, Heavy Duty: Support for wall-hung fixture, having rectangular steel uprights that transfer weight to the floor.
 - 4. Reinforcement: Wood blocking or steel plate built into wall construction, for securing fixture to wall.
- J. Trim: Hardware and miscellaneous parts, specific to a fixture and normally supplied with it required to complete fixture assembly and installation.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.
- C. Wiring diagrams for field-installed wiring of electrically operated units.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of ANSI Standard A117.1, "Buildings and Facilities -- Providing Accessibility and Useability for Physically Handicapped People," and Public Law 90-480, "Architectural Barriers Act, 1968," with respect to plumbing fixtures for the physically handicapped.
- B. Regulatory Requirements: Comply with requirements of ATBCB (Architectural and Transportation Barriers Compliance Board) "Uniform Federal Accessibility Standards (UFAS) - 1985-494-187" with respect to plumbing fixtures for the physically handicapped.

- C. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.
 - 1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

- D. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of plumbing fixtures is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.
- B. Store plumbing fixtures on elevated platforms in a dry location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:
 - 1. Water Closets:
 - a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Kohler Co.

 - 2. Urinals:
 - a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Kohler Co.

 - 3. Lavatories:
 - a. Acorn Engineering Co.
 - b. American Standard, Inc.

- c. Crane Plumbing/Fiat Products.
 - d. Eljer; A Household International Co.
 - e. Just Manufacturing Co.
 - f. Kohler Co.
4. Sinks:
- a. American Standard, Inc.
 - b. Crane Plumbing/Fiat Products.
 - c. Eljer; A Household International Co.
 - d. Elkay Manufacturing Co.
 - e. Just Manufacturing Co.
 - f. Kohler Co.
5. Service Sinks:
- a. Acorn Engineering Co.
 - b. American Standard, Inc.
 - c. Crane Plumbing/Fiat Products.
 - d. Eljer; A Household International Co.
 - e. Elkay Manufacturing Co.
 - f. Just Manufacturing Co.
 - g. Kohler Co.
6. Mop Basins:
- a. Aqua Glass Corp.
 - b. Crane Plumbing/Fiat Products.
 - c. Florestone Products Co., Inc.
 - d. Stern-Williams Co., Inc.
 - e. Swan Corp.
 - f. Fiat
7. Water Coolers:
- a. Elkay Manufacturing Co.
 - b. Halsey Taylor; A Household International Co.
 - c. Haws Drinking Faucet Co.
 - d. Sunroc Corp.
 - e. Western Drinking Fountains; Sunroc Corp.
 - f. Oasis
8. Outlet Boxes:
- a. Guy Gray Manufacturing Co., Inc.
 - b. Symmons Industries, Inc.
9. Toilet Seats:
- a. Bemis Mfg. Co.

- b. Beneke Div.; Sanderson Plumbing Products, Inc.
 - c. Church Seat Co.
 - d. Kohler Co.
11. Flushometers:
- a. Coyne & Delany Co.
 - b. Sloan Valve Co.
 - c. Zurn Industries, Inc.; Flush Valve Operations.
12. Commercial/Industrial Cast-Brass Faucets:
- a. American Standard, Inc.
 - b. Chicago Faucet Co.
 - c. Eljer; A Household International Co.
 - d. Kohler Co.
 - e. Speakman Co.
 - f. T & S Brass and Bronze Works, Inc.
13. Commercial/Residential Cast-Brass and Cast-Brass Underbody Faucets:
- a. American Standard, Inc.
 - b. Chicago Faucet Co.
 - c. Delta Faucet Co.; Div. of Masco Corp.
 - d. Eljer; A Household International Co.
 - e. Elkay Manufacturing Co.
 - f. Kohler Co.
 - g. Speakman Co.
 - h. Symmons Industries, Inc.
 - i. T & S Brass and Bronze Works, Inc.
 - j. Valley Faucets Div.; U.S. Brass.
14. Miscellaneous Fittings (Except Faucets):
- a. Aquaflo Corp.
 - b. Beaton & Corbin Mfg. Co.
 - c. Brass Craft Subsidiary; Masco Co.
 - d. Bridgeport Plumbing Products, Inc.
 - e. Central Brass Manufacturing Co.
 - f. Chicago Faucet Co.
 - g. Connecticut Stamping & Bending Co.
 - h. Crane Plumbing/Fiat Products.
 - i. Eljer; A Household International Co.
 - j. Kohler Co.
 - k. McGuire Manufacturing Co., Inc.
 - l. Royal Brass Mfg. Co.
 - m. T & S Brass and Bronze Works, Inc.
17. Supports:

- a. Josam Co.
- b. Smith (Jay R.) Mfg. Co.
- c. Wade Div.; Tyler Pipe.
- d. Zurn Industries, Inc.; Hydromechanics Div.

2.2 PLUMBING FIXTURES, GENERAL

- A. Provide plumbing fixtures and trim, fittings, other components, and supports as specified.

2.3 FAUCETS

- A. Faucets General: Unless otherwise specified, provide faucets that are cast brass with polished chrome-plated finish.
- B. Shower Faucet: ASME A112.18.1M, cast-brass combination single-lever, pressure-balancing mixing valve and escutcheon, and shower head, arm, and flange. Polished chrome-plated finish on all exposed metal.

2.4 FITTINGS, EXCEPT FAUCETS

- A. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.
- B. Lavatory Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 3/8 inch by 12 inches flexible tubing riser outlet.
- C. Lavatory Traps: Cast-brass, 1-1/4 inches NPS adjustable P-trap with cleanout, 0.045-inch wall thickness, tubular waste to wall, and wall flange.
- D. Sink Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 1/2 inch by 12 inches flexible tubing riser outlet.
- E. Water Closet Supplies and Stops: Wheel handle angle stop, having 1/2 inch NPS inlet with wall flange and 1/2 inch by 12 inches flexible tubing riser outlet with collar.
- F. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.
- G. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.

2.5 FLUSHOMETERS

- A. Provide flushometers compatible with fixtures, with features and of consumption indicated.

- B. Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.
- C. Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.
- D. Urinal Flushometers: Furnish with following features.
 - 1. Non-hold-open feature.
 - 2. Furnish flushometers with factory-set or field-adjusted maximum water consumption per cycle:
 - a. Consumption: 1.0 gallons per flushing cycle.

2.6 TOILET SEATS

- A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.
- B. Toilet Seats: Extra heavy-duty, commercial/industrial type, elongated, open front, solid plastic, with check hinge.

2.7 PLUMBING FIXTURE SUPPORTS

- A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.
- B. Support categories are:
 - 1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction.
 - 2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.
 - 3. Reinforcement: 1/4 inch by 6 inches steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.
- C. Support Types: Provide support of category specified, of type having features required to match fixture.
- D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for potable cold water and hot water supplies and soil, waste, and vent piping systems to verify actual locations of piping connections prior to installing fixtures.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

- A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.
- B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
 - 1. Carriers for following fixtures:
 - a. Wall-hanging fixtures supported from wall construction.
 - 2. Chair carriers for the following fixtures:
 - a. Wall-hanging urinals.
 - b. Wall-hanging lavatories and sinks.
 - c. Wall-hanging drinking fountains and electric water coolers.
 - 3. Reinforcement for the following fixtures:
 - a. Floor-mounted lavatories required to be secured to wall.
 - b. Floor-mounted sinks required to be secured to wall.
 - c. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

- A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers' written installation instructions, roughing-in drawings, and referenced standards.
- B. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.
- C. Install wall-hanging, back-outlet urinals with gasket seals.
- D. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
- E. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

- F. Fasten wall-mounted fittings to reinforcement built into walls.
- G. Fasten counter-mounting-type plumbing fixtures to casework.
- H. Secure supplies behind wall or within wall pipe space, providing rigid installation.
- I. Set shower receptors and mop basins in leveling bed of cement grout.
- J. Install stop valve in an accessible location in each water supply to each fixture.
- K. Install trap on fixture outlet except for fixtures having integral trap.
- L. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
- M. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.4 CONNECTIONS

- A. Piping installation requirements are specified in other sections of Division 15. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
 - 1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other sections of Division 15.
 - 2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.

- C. Replace washers of leaking and dripping faucets and stops.
- D. Clean fixtures, fittings, and spout and drain strainers with manufacturers' recommended cleaning methods and materials.
- E. Review the data in Operating and Maintenance Manuals.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

END OF SECTION 15440

SECTION 15820 DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Fire and smoke dampers.
 - 4. Duct silencers.
 - 5. Turning vanes.
 - 6. Duct-mounted access doors and panels.
 - 7. Flexible ducts.
 - 8. Flexible connectors.
 - 9. Duct accessory hardware.
- B. Related Sections include the following:
 - 1. Division 15 Section "Diffusers, Registers, and Grilles."
 - 2. Division 15 Section "Control Systems Equipment" for electric and pneumatic damper actuators.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Fire and smoke dampers.
 - 4. Duct silencers.
 - 5. Duct-mounted access doors and panels.
 - 6. Flexible ducts.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual- and automatic-volume-damper installations.
2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- C. Aluminum Sheets: ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.
- D. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations.
- B. Frame: 0.052-inch- (1.3-mm-) thick, galvanized, sheet steel, with welded corners and mounting flange.
- C. Blades: 0.025-inch- (0.6-mm-) thick, roll-formed aluminum.
- D. Blade Seals: Felt.

- E. Blade Axles: Galvanized steel.
- F. Tie Bars and Brackets: Galvanized steel.
- G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

- A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
 - 1. Pressure Classifications of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.
- B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 0.064 inch (1.62 mm) thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
 - 2. Roll-Formed Steel Blades: 0.064-inch- (1.62-mm-) thick, galvanized, sheet steel.
 - 3. Blade Axles: Galvanized steel.
 - 4. Tie Bars and Brackets: Galvanized steel.

2.4 FIRE DAMPERS

- A. General: Labeled to UL 555.
- B. Fire Rating: One and one-half hours.
- C. Frame: SMACNA Type A with blades in airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- D. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.
- E. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
 - 1. Minimum Thickness: 0.052 inch (1.3 mm) or 0.138 inch (3.5 mm) thick as indicated, and length to suit application.
 - 2. Exceptions: Omit sleeve where damper frame width permits direct attachment of

perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.

- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized steel blade connectors.
- H. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.
- I. Fusible Link: Replaceable, 165 rated.

2.5 CEILING FIRE DAMPERS

- A. General: Labeled to UL 555C; comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- B. Frame: 0.040-inch- (1.0-mm-) thick, galvanized, sheet steel; round or rectangular; style to suit ceiling construction.
- C. Blades: 0.034-inch- (0.85-mm-) thick, galvanized, sheet steel with nonasbestos refractory insulation.
- D. Fusible Link: Replaceable, 165 deg F (74 deg C) rated.

2.6 DUCT SILENCERS

- A. General: Factory-fabricated and -tested, round or rectangular silencer with performance characteristics and physical requirements as indicated.
- B. Fire Performance: Adhesives, sealers, packing materials, and accessory materials shall have fire ratings not exceeding 25 for flame spread and 50 for smoke developed when tested according to ASTM E 84.
- C. Rectangular Units: Fabricate casings with a minimum of 0.034-inch- (0.85-mm-) thick, solid sheet metal for outer casing and 0.022-inch- (0.55-mm-) thick, perforated sheet metal for inner casing.
- D. Sheet Metal Perforations: 1/8-inch (3-mm) diameter for inner casing and baffle sheet metal.
- E. Fibrous Acoustic-Fill Material: Inert and vermin-proof fibrous material, packed under not less than 5 percent compression.
- F. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations.
 - 1. Do not use nuts, bolts, and sheet metal screws for unit assemblies.

2. Lock form and seal or continuously weld joints.
3. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
4. Reinforcement: Cross or trapeze angles for rigid suspension.

G. Source Quality Control: Perform the following factory tests:

1. Acoustic Performance: Test according to ASTM E 477, with airflow in both directions through silencer.
2. Record acoustic ratings, including dynamic insertion loss and self-noise power levels, for both forward flow (air and noise in same direction) and reverse flow (air and noise in opposite directions) with an airflow of at least 2000-fpm (10-m/s) face velocity.
3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch wg (1500-Pa) static pressure, whichever is greater.

2.7 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch- (38-mm-) wide, curved blades set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into side strips suitable for mounting in ducts.
- C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.8 DUCT-MOUNTED ACCESS DOORS AND PANELS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class.
- B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.9 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.
- C. Conventional, Indoor System Flexible Connector Fabric: Glass fabric double coated with polychloroprene.
 - 1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
 - 2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

2.10 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1.
- B. Flexible Ducts, Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.
- C. Flexible Ducts, Uninsulated: Corrugated aluminum.
- D. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch- (38-mm-) thick, glass-fiber insulation around a continuous inner liner.
 - 1. Reinforcement: Steel-wire helix encapsulated in inner liner.
 - 2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 - 3. Inner Liner: Polyethylene film.
- E. Pressure Rating: 6-inch wg (1500 Pa) positive, 1/2-inch wg (125 Pa) negative.

2.11 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 length to suit duct insulation thickness.
- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.
- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.
- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and NAIMA's "Fibrous Glass Duct Construction Standards" for fibrous-glass ducts.
- B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.
- C. Provide test holes at fan inlet and outlet and elsewhere as indicated.
- D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
 - 1. Install fusible links in fire dampers.
- E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
 - 1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
 - 2. Install access panels on side of duct where adequate clearance is available.

3.2 ADJUSTING

- A. Adjust duct accessories for proper settings.
- B. Adjust fire and smoke dampers for proper action.
- C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION 15820

SECTION 15891 METAL DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 15 Sections apply to this section:
 - 1. "Basic Mechanical Requirements."
 - 2. "Basic Mechanical Materials and Methods."

1.2 SUMMARY

- A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air conditioning systems in pressure classes from minus 2 inches to plus 10 inches water gage.

1.3 DEFINITIONS

- A. Sealing Requirements Definitions: For the purposes of duct systems sealing requirements specified in this Section, the following definitions apply:
 - 1. Seams: A seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. All other duct surface connections made on the perimeter are deemed to be joints.
 - 2. Joints: Joints include girth joints; branch and subbranch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum, and casing abutments to building structures.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. The duct system design, as indicated, has been used to select and size air moving and distribution equipment and other components of the air system. Changes or alterations to the layout or configuration of the duct system must be specifically approved in writing. Accompany requests for layout modifications with calculations showing that the proposed layout will provide the original design results without increasing the system total pressure.

1.5 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:
 - 1. Duct Liner.
 - 2. Sealing Materials.
 - 3. Fire-Stopping Materials.
- C. Shop drawings from duct fabrication shop, drawn to a scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as the Contract Drawings, detailing:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 - 2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust ducts systems, indicate the classification of the materials handled as defined in this Section.
 - 3. Fittings.
 - 4. Reinforcing details and spacing.
 - 5. Seam and joint construction details.
 - 6. Penetrations through fire-rated and other partitions.
 - 7. Terminal unit, coil, and humidifier installations.
 - 8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- D. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in "Quality Assurance" below.
- E. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 1.
- F. Maintenance data for volume control devices, fire dampers, and smoke dampers, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 1.

1.6 QUALITY ASSURANCE

- A. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel" for hangers and supports and AWS D9.1 "Sheet Metal Welding Code."
- B. Qualify each welder in accordance with AWS qualification tests for welding processes involved. Certify that their qualification is current.
- C. NFPA Compliance: Comply with the following NFPA Standards:
 - 1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.
 - 2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct

System," for kitchen hood duct systems, except as indicated otherwise.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sealant and fire-stopping materials to site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle sealant fire-stopping materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. Deliver and store stainless steel sheets with mill-applied adhesive protective paper, maintained through fabrication and installation.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
- C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
- D. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.
- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCT LINER

- A. General: Comply with NFPA Standard 90A and TIMA Standard AHC-101.
- B. Materials: ASTM C 1071, Type II, with coated surface exposed to airstream to prevent erosion of glass fibers.
 - 1. Thickness: 1 inch.
 - 2. Density: 2 pounds.
 - 3. Thermal Performance: "K-Factor" equal to 0.28 or better, at a mean temperature of 75 deg F.
 - 4. Fire Hazard Classification: Flame spread rating of not more than 25 without evidence of continued progressive combustion and a smoke developed rating of no higher than

50, when tested in accordance with ASTM C 411.

5. Liner Adhesive: Comply with NFPA Standard 90A and ASTM C 916.
6. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct. Provide fasteners that do not damage the liner when applied as recommended by the manufacturer, that do not cause leakage in the duct, and will indefinitely sustain a 50-pound tensile dead load test perpendicular to the duct wall.
 - a. Fastener Pin Length: As required for thickness of insulation, and without projecting more than 1/8 inch into the airstream.
 - b. Adhesive For Attachment of Mechanical Fasteners: Comply with the "Fire Hazard Classification" of duct liner system.

2.3 SEALING MATERIALS

- A. Joint and Seam Sealants, General: The term sealant used here is not limited to materials of adhesive or mastic nature, but also includes tapes and combinations of open weave fabric strips and mastics.
- B. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant complying with FS TT-S-001657, Type I; formulated with a minimum of 75 percent solids.
- C. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.4 FIRE-STOPPING

- A. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
 2. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
 3. "RTV 7403"; General Electric Co.
 4. "Fyre Putty"; Standard Oil Engineered Materials Co.

2.5 HANGERS AND SUPPORTS

- A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.
- B. Hangers: Galvanized sheet steel, or round, uncoated steel, threaded rod.

1. Straps and Rod Sizes: Conform with Table 4-1 in SMACNA HVAC Duct Construction Standards, 1985 Edition, for sheet steel width and gage and steel rod diameters.
- C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- D. Trapeze and Riser Supports: Steel shapes conforming to ASTM A 36.
 1. Where galvanized steel ducts are installed, provide hot-dipped-galvanized steel shapes and plates.
 2. For stainless steel ducts, provide stainless steel support materials.
 3. For aluminum ducts, provide aluminum support materials, except where materials are electrolytically separated from ductwork.

2.6 RECTANGULAR DUCT FABRICATION

- A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
 1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
 2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
- B. Fabricate kitchen hood exhaust ducts with 16-gage, carbon steel sheets for concealed ducts and 18-gage stainless steels for exposed ducts. Weld and flange seams and joints. Conform to NFPA Standard 96.
- C. Fabricate dishwasher hood exhaust ducts with 18-gage stainless steels. Weld and flange seams and joints.
- D. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
 1. Supply Ducts: 3 inches water gage.
 2. Return Ducts: 2 inches water gage, negative pressure.
 3. Exhaust Ducts: 2 inches water gage, negative pressure.
- E. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard," Figure 1-4, unless they are lined or are externally insulated.

2.7 RECTANGULAR DUCT FITTINGS

- A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in

accordance with SMACNA "HVAC Metal Duct Construction Standard," 1985 Edition, Figures 2-1 through 2-10.

2.8 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is prohibited.
- B. Apply a coat of adhesive to liner facing in direction of airflow not receiving metal nosing.
- C. Butt transverse joints without gaps and coat joint with adhesive.
- D. Fold and compress liner in corners of rectangular ducts or cut and fit to assure butted edge overlapping.
- E. Longitudinal joints in rectangular ducts shall not occur except at corners of ducts, unless the size of the duct and standard liner product dimensions make longitudinal joints necessary.
- F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- G. Secure transversely oriented liner edges facing the airstream with metal nosings that are either channel or "Z" profile or are integrally formed from the duct wall at the following locations:
 - 1. Fan discharge.
 - 2. Intervals of lined duct preceding unlined duct.
- H. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to the duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire damper sleeve through fire separation.

2.9 ROUND AND FLAT OVAL DUCT FABRICATION

- A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet. Insulate all round duct with 1 1/2" external wrap insulation.
- B. Round Ducts: Fabricate round supply ducts with spiral lockseam construction, except where diameters exceed 72 inches. Fabricate ducts having diameters greater than 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.

- C. Round Ducts: Fabricate round supply ducts using seam types identified in SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figure 3-1, RL-1, RL-4, or RL-5. Seams Types RL-2 or RL-3 may be used if spot-welded on 1-inch intervals. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- D. Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lockseams (without intermediate ribs) or with butt-welded longitudinal seams in gages listed in SMACNA "HVAC Duct Construction Standards," Table 3-4.

2.10 ROUND AND FLAT OVAL SUPPLY AND EXHAUST FITTINGS FABRICATION

- A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 1985 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
- C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
 - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
 - a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.
 - b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from minus 2 inches to plus 2 inches:
 - 1) 3 to 26 inches: 24 gage.
 - 2) 27 to 36 inches: 22 gage.
 - 3) 37 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - c. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:
 - 1) 3 to 14 inches: 24 gage.
 - 2) 15 to 26 inches: 22 gage.
 - 3) 27 to 50 inches: 20 gage.
 - 4) 52 to 60 inches: 18 gage.
 - 5) 62 to 84 inches: 16 gage.
 - d. Flat Oval Mitered Elbows: Solid welded and with the same metal thickness as longitudinal seam flat oval duct.
 - e. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust

systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.

2. Round Elbows - 8 Inches and Smaller: Die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.
3. Round Elbows - 9 Through 14 Inches: Gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 1/2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
4. Round Elbows - Larger Than 14 Inches and All Flat Oval Elbows: Gored elbows, except where space restrictions require a mitered elbow.
5. Die-Formed Elbows for Sizes Through 8 Inches and All Pressures: 20 gage with 2-piece welded construction.
6. Round Gored Elbows Gages: Same as for nonelbow fittings specified above.
7. Flat Oval Elbows Gages: Same as longitudinal seam flat oval duct.
8. Pleated Elbows Sizes Through 14 Inches and Pressures Through 10 Inches: 26 gage.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
- B. Install ducts with the fewest possible joints.
- C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- D. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
- E. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment.
- F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- G. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
- H. Install insulated ducts with 1-inch clearance outside of insulation.

- I. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
- J. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
- K. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- L. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2 inches.

3.2 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints as follows:
 - B. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams, and duct penetrations.
 - C. Pressure Classification 2 and 3 Inches Water Gage: All transverse joints and longitudinal seams.
 - 1. Pressure Classification Less than 2 Inches Water Gage: Transverse joints only.
- D. Seal externally insulated ducts prior to insulation installation.

3.3 HANGING AND SUPPORTING

- A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
- C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
- E. Install concrete insert prior to placing concrete.
- F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS

- A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 15 Section "Duct Accessories."
- B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.
- C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
- D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.

3.5 FIELD QUALITY CONTROL

- A. The Owner will contract with an independent testing agency to perform, record, and report leakage tests.
- B. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.

3.6 ADJUSTING AND CLEANING

- A. Adjust volume control devices as required by the testing and balancing procedures to achieve required air flow. Refer to Division 15 Section "TESTING, ADJUSTING, AND BALANCING" for requirements and procedures for adjusting and balancing air systems.
- B. Vacuum ducts systems prior to final acceptance to remove dust and debris.

END OF SECTION 15891

SECTION 15932 AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of outlets and inlets required for project include the following:
 - 1. Ceiling air diffusers.
 - 2. Wall registers and grilles.
 - 3. Louvers.

1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
 - 1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
 - 2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
 - 3. AMCA Compliance: Test and rate louvers in accordance with AMCA 500 "Test Method for Louvers, Dampers and Shutters".
 - 4. AMCA Seal: Provide louvers bearing AMCA Certified Rating Seal.
 - 5. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
 3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses; throw and drop; and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.
- C. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS

- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
- D. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering diffusers which may be incorporated in the work include, but are not limited to, the following:

1. Anemostat Products Div.; Dymanics Corp. of America.
2. Cranes Co.; Div. of Wehr Corp.
3. Krueger Mfg. Co.
4. Titus Products Div.; Philips Industries, Inc.
5. Tuttle & Bailey; Div. of Interpace Corp.

2.2 WALL REGISTERS AND GRILLES

- A. General: Except as otherwise indicated, provide manufacturer's standard wall registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide wall registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- C. Wall Compatibility: Provide registers and grilles with border styles that are compatible with adjacent wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction which will contain each type of wall register and grille.
- D. Types: Provide wall registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule.
- E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering registers and grilles which may be incorporated in the work include, but are not limited to, the following:
 1. Anemostat Products Div.; Dynamics Corp. of America.
 2. Carnes Co.; Div. of Wehr Corp.
 3. Titus Products Div.; Philips Industries, Inc.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Coordinate with other work, including ductwork and duct accessories, as necessary to

interface installation of air outlets and inlets with other work.

- C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

3.3 SPARE PARTS

- A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION 15932

SECTION 15990 TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. This Section specifies the requirements and procedures total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
- B. Test, adjust, and balance the following mechanical systems:
 - 1. Supply air systems, all pressure ranges; including variable volume and double duct systems;
 - 2. Return air systems;
 - 3. Exhaust air systems;
 - 4. Verify temperature control system operation.
 - 5. Test and balance shall include complete coil performance (db/wb temperatures entering and leaving) for each operating mode
- C. Test systems for proper sound and vibration levels.
- D. This Section does not include:
 - 1. specifications for materials for patching mechanical systems;
 - 2. specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

1.3 DEFINITIONS

- A. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
 - 1. the balance of air and water distribution;
 - 2. adjustment of total system to provide design quantities;
 - 3. electrical measurement;
 - 4. verification of performance of all equipment and automatic controls;

5. sound and vibration measurement.

- B. Test: To determine quantitative performance of equipment.
- C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).
- D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
- E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
- F. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.
- G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
- H. Main: Duct or pipe containing the system's major or entire fluid flow.
- I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.
- J. Branch main: Duct or pipe serving two or more terminals.
- K. Branch: Duct or pipe serving a single terminal.

1.4 SUBMITTALS

- A. Agency Data:
 - 1. Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
- B. Engineer and Technicians Data:
 - 1. Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.
- C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
- D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust,

and balance the building systems. Include this information in maintenance data specified in Division 1 and Section 15010.

- E. Sample Forms: Submit sample forms, if other than those standard forms prepared by the NEBB are proposed.
- F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
 - 1. Draft reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.
 - 2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports.
 - 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary
 - b. Air Systems
 - c. Temperature Control Systems
 - d. Special Systems
 - e. Sound and Vibration Systems
 - 4. Report Contents: Provide the following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC and NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective

report form.

- G. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.5 QUALITY ASSURANCE

A. PRE-QUALIFIED CONTRACTORS FOR THIS ROLE.

1. Superior Test & Balance, Inc. (AABC)
1545 Gulf Shores Parkway, PMB #294
Gulf Shores, AL 36542
Tel: 251.317.3088
2. Systems Analysis, Inc. (AABC & NEBB)
217 Oxmoor Circle
Birmingham, AL 35209
Tel: 205.802.7850
3. National True-Test, Inc. (NEBB)
5757 Carrington Lake Parkway
Trussville, AL 35173
Tel: 205.681.9050
4. Environmental Testing Service, Inc. (NEBB)
150 Highway 216
Montevallo, AL 35115
Tel: (205) 476-8640
5. Performance Testing & Balancing Co., Inc. (AABC)
2021 Five Points Road
Cleveland, Alabama 35049
Tel: (205) 559-2773

- B. Any Test & Balance Contractors not listed above must be requested and approved in writing ten (10) days prior to the bid.

C. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
2. The independent testing, adjusting, and balancing agency certified by National

Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified by NEBB as a Test and Balance Engineer.

B. Codes and Standards:

1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
2. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

C. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.6 PROJECT CONDITIONS

A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.7 SEQUENCING AND SCHEDULING

A. Test, adjust, and balance the air systems before refrigerant systems.

B. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F (3 degs C) wet bulb temperature of maximum summer design condition, and within 10 deg F (6 deg C) dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps:

1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
3. Compare design to installed equipment and field installations.

4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
5. Check filters for cleanliness.
6. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
7. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.
8. Determine best locations in main and branch ductwork for most accurate duct traverses.
9. Place outlet dampers in the full open position.
10. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
11. Lubricate all motors and bearings.
12. Check fan belt tension.
13. Check fan rotation.

3.2 MEASUREMENTS

- A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- B. Provide instruments meeting the specifications of the referenced standards.
- C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D. Apply instrument as recommended by the manufacturer.
- E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
- F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- G. Take all reading with the eye at the level of the indicated value to prevent parallax.
- H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
- I. Take measurements in the system where best suited to the task.

3.3 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Perform testing and balancing procedures on each system identified, in accordance with the

detailed procedures outlined in the referenced standards.

- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.4 TESTING FOR SOUND AND VIBRATION

- A. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

3.5 RECORD AND REPORT DATA

- A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.
- B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.6 DEMONSTRATION

- A. Training:
 - 1. Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with the Owner's personnel, the information contained in the Operating and Maintenance Data specified in Division 1 and Section 15010.
 - 2. Schedule training with Owner through the Architect/Engineer with at least 7 days prior notice.

END OF SECTION 15990

SECTION 16050
BASIC ELECTRICAL MATERIALS AND METHODS

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:
 1. Supporting devices for electrical components.
 2. Electrical identification.
 3. Electricity-metering components.
 4. Concrete equipment bases.
 5. Electrical demolition.
 6. Cutting and patching for electrical construction.
 7. Touchup painting.

1.3 QUALITY ASSURANCE

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

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick (150 mm wide by 0.102 mm thick).
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.

4. Printed legend that indicates type of underground line.
 - C. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
 - D. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
 - E. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners **1/16-inch (1.6-mm)** minimum thickness for signs up to **20 sq. in. (129 sq. cm)** and **1/8-inch (3.2-mm)** minimum thickness for larger sizes. Engraved legend in black letters on white background.
 - F. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Pre-printed, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
 - G. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with **0.0396-inch (1-mm)**, galvanized-steel backing, with colors, legend, and size appropriate to the application. **1/4-inch (6-mm)** grommets in corners for mounting.
 - H. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.
- 2.3 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING
- A. Meter Sockets: Comply with requirements of electrical power utility company.
- 2.4 CONCRETE BASES
- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."
 - B. Concrete: **3000-psi (20.7-MPa)**, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."
- 2.5 TOUCHUP PAINT
- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
 - B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least **12 inches (300 mm)** of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of **200-lb (90-kg)** design load.

3.4 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install **1/4-inch- (6-mm-)** diameter or larger threaded steel hanger rods, unless otherwise indicated.

- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 3/4-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - 8. Light Steel: Sheet-metal screws.
 - 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.
- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate **6 to 8 inches (150 to 200 mm)** below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed **16 inches (400 mm)**, overall, use a single line marker.
- F. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

3.6 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

- A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.7 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.8 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than **4 inches (100 mm)** larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.9 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, **2 inches (50 mm)** below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove demolished material from Project site.

- E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.10 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.11 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 1. Supporting devices for electrical components.
 2. Electrical identification.
 3. Electricity-metering components.
 4. Concrete bases.
 5. Electrical demolition.
 6. Cutting and patching for electrical construction.
 7. Touchup painting.

3.12 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.13 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

SECTION 16060 GROUNDING AND BONDING

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 grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Grounding Conductors, Cables, Connectors, and Rods:
 - a. Apache Grounding/Erico Inc.
 - b. Chance/Hubbell.
 - c. Copperweld Corp.
 - d. Dossert Corp.
 - e. Erico Inc.; Electrical Products Group.
 - f. Framatome Connectors/Burndy Electrical.
 - g. Galvan Industries, Inc.
 - h. Ideal Industries, Inc.
 - i. ILSCO.
 - j. Kearney/Cooper Power Systems.
 - k. Lyncole XIT Grounding.
 - l. O-Z/Gedney Co.; a business of the EGS Electrical Group.
 - m. Raco, Inc.; Division of Hubbell.
 - n. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored insulation.
- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Assembly of Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
 - 1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, **1/4 inch (6.4 mm)** in diameter.
 - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
 - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; **1-5/8 inches (42 mm)** wide and **1/16 inch (1.5 mm)** thick.
 - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; **1-5/8 inches (42 mm)** wide and **1/16 inch (1.5 mm)** thick.
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel.
 - 1. Size: **3/4 by 120 inches.**

PART 3 - EXECUTION

3.1 APPLICATION

- A. In raceways, use insulated equipment grounding conductors.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.
- C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- D. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.
- E. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat-tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- F. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6.4-by-50-by-300-mm) grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- G. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

3.3 INSTALLATION

- A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.
 - 1. Drive ground rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
 - 2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
- B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
- D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
- E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.
- F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector

manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
 - a. Equipment Rated 500 kVA and Less: 10 ohms.
 - b. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - c. Equipment Rated More Than 1000 kVA: 3 ohms.
 - 2. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16120 CONDUCTORS AND CABLES

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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wires and Cables:
 - a. American Insulated Wire Corp.; Leviton Manufacturing Co.
 - b. BICC Brand-Rex Company.
 - c. Senator Wire & Cable Company.
 - d. Southwire Company.
 - 2. Connectors for Wires and Cables:
 - a. AMP Incorporated.
 - b. General Signal; O-Z/Gedney Unit.
 - c. Monogram Co.; AFC.
 - d. Square D Co.; Anderson.
 - e. 3M Company; Electrical Products Division.

2.2 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Rubber Insulation Material: Comply with NEMA WC 3.
- C. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- F. Conductor Material: Copper.
- G. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

2.3 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

- A. Service Entrance: Type RHW or THWN, in raceway.
- B. Feeders: Type THHN/THWN, in raceway.
- C. Branch Circuits: Type THHN/THWN, in raceway.
- D. Fire Alarm Circuits: Type THHN/THWN, in raceway.
- E. Class 1 Control Circuits: Type THHN/THWN, in raceway.
- F. Class 2 Control Circuits: Type THHN/THWN, in raceway.

3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Remove existing wires from raceway before pulling in new wires and cables.
- C. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- G. Seal around cables penetrating fire-rated elements according to Division 7 Section "Firestopping."
- H. Identify wires and cables according to Division 16 Section "Basic Electrical Materials and Methods."

3.4 CONNECTIONS

- A. Conductor Splices: Keep to minimum.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.
- D. Wiring at Outlets: Install conductor at each outlet, with at least **12 inches (300 mm)** of slack.
- E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

- F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 16120

SECTION 16130 RACEWAYS AND BOXES

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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

- 1. Raceways include the following:

- a. RMC.
 - b. IMC.
 - c. EMT.
 - d. FMC.
 - e. LFMC.
 - f. LFNC.
 - g. RNC.

- 2. Boxes, enclosures, and cabinets include the following:

- a. Device boxes.
 - b. Outlet boxes.
 - c. Pull and junction boxes.

- B. Related Sections include the following:

- 1. Division 7 Section "Firestopping."
 - 2. Division 16 Section "Basic Electrical Materials and Methods" for raceways and box supports.
 - 3. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.

- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RMC: Rigid metal conduit.
- H. RNC: Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation."
- C. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Metal Conduit and Tubing:
 - a. Alflex Corp.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. Anixter Brothers, Inc.
 - d. Grinnell Co.; Allied Tube and Conduit Div.
 - e. Monogram Co.; AFC.
 - f. Wheatland Tube Co.
 - 2. Nonmetallic Conduit and Tubing:
 - a. Anamet, Inc.; Anaconda Metal Hose.
 - b. Hubbell, Inc.; Raco, Inc.
 - c. Lamson & Sessions; Carlon Electrical Products.
 - d. R&G Sloan Manufacturing Co., Inc.
 - e. Thomas & Betts Corp.
 - 3. Conduit Bodies and Fittings:
 - a. American Electric; Construction Materials Group.

- b. Crouse-Hinds; Div. of Cooper Industries.
- c. Emerson Electric Co.; Appleton Electric Co.
- d. Hubbell, Inc.; Killark Electric Manufacturing Co.
- e. Lamson & Sessions; Carlon Electrical Products.
- f. O-Z/Gedney; Unit of General Signal.
- g. Scott Fetzer Co.; Adalet-PLM.
- h. Spring City Electrical Manufacturing Co.

4. Boxes, Enclosures, and Cabinets:

- a. Crouse-Hinds; Div. of Cooper Industries.
- b. Electric Panelboard Co., Inc.
- c. Erickson Electrical Equipment Co.
- d. Hoffman Engineering Co.; Federal-Hoffman, Inc.
- e. Hubbell Inc.; Killark Electric Manufacturing Co.
- f. Hubbell Inc.; Raco, Inc.
- g. Lamson & Sessions; Carlon Electrical Products.
- h. O-Z/Gedney; Unit of General Signal.
- i. Thomas & Betts Corp.
- j. Woodhead Industries, Inc.; Daniel Woodhead Co.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- D. Plastic-Coated IMC and Fittings: NEMA RN 1.
- E. EMT and Fittings: ANSI C80.3.
 - 1. Fittings: Compression type.
- F. FMC: Zinc-coated steel.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.
- B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- C. LFNC: UL 1660.

2.4 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1.

- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box with gasketed cover.
- C. Nonmetallic Boxes: NEMA OS 2.

2.5 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 3R.

3.3 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Minimum Raceway Size: **1/2-inch trade size (DN16)**.
- C. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

- D. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- H. Use temporary closures to prevent foreign matter from entering raceways.
- I. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- J. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- K. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- L. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- M. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least **1-inch (25-mm)** concrete cover.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than **1-inch trade size (DN27)** parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 4. Transition from nonmetallic tubing to rigid steel conduit before rising above floor.
- N. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
- P. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.
- Q. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

- R. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.
- S. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- T. Do not install aluminum conduits embedded in or in contact with concrete.
- U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 16130

SECTION 16140 WIRING DEVICES

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 receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

- A. Product Data: For each product specified.
- B. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NEMA WD 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc.

- b. Eagle Electric Manufacturing Co., Inc.
- c. Hubbell, Inc.; Wiring Devices Div.
- d. Leviton Manufacturing Co., Inc.
- e. Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

- A. Straight-Blade and Locking Receptacles: Heavy-Duty grade, 20A.
- B. GFCI Receptacles: Termination type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle. Design units for installation in a **2-3/4-inch- (70-mm-)** deep outlet box without an adapter.

2.3 SWITCHES

- A. Snap Switches: Heavy-duty, quiet type.

2.4 WALL PLATES

- A. Single and combination types match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: **0.04-inch- (1-mm-)** thick, Type 302, satin-finished stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.

2.5 FINISHES

- A. Color: Gray, unless otherwise indicated or required by Code.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
- C. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- D. Protect devices and assemblies during painting.

3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.

3.3 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.5 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

SECTION 16442 PANELBOARDS

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 panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
 - 1. Lighting and appliance branch-circuit panelboards.
 - 2. Distribution panelboards.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Cutler Hammer
 - b. General Electric Co.; Electrical Distribution & Control Div.
 - c. Eaton

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush or surface mounted cabinets as indicated on drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
 - 1. Outdoor Locations: NEMA 250, Type 3R.
- B. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
- C. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
- D. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- E. Bus: Hard-drawn copper, 98 percent conductivity.
- F. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- G. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

- H. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- J. Isolated Equipment Ground Bus: When noted on drawings, install isolated equipment ground bus adequate for branch-circuit equipment ground conductors; insulated from box.
- K. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device. Provide only when necessary or when noted on the drawings.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 DISTRIBUTION PANELBOARDS

- A. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike.
- B. Main Overcurrent Protective Devices: Circuit breaker.
- C. Branch overcurrent protective devices shall be one of the following:
 - 1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
 - 2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
 - 3. Fused switches.

2.6 OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I²t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
 6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
- B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.
1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.
 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
 3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mounting Heights: Top of trim **74 inches (1880 mm)** above finished floor, unless otherwise indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- D. Circuit Directory: Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- E. Install filler plates in unused spaces.
- F. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Basic Electrical Materials and Methods".

- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

- A. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16442

SECTION 16475 FUSES

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:
 - 1. Fuses.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from one source and by a single manufacturer.
- B. Comply with NFPA 70 for components and installation.
- C. Listing and Labeling: Provide fuses specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide fuses by one of the following:
 - 1. Cooper Industries, Inc.; Busmann Div.
 - 2. General Electric Co.; Wiring Devices Div.
 - 3. Gould Shawmut.
 - 4. Tracor, Inc.; Littelfuse, Inc. Subsidiary.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class as specified or indicated; current rating as indicated; voltage rating consistent with circuit voltage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Main Service: Class L, fast acting.
- B. Main Feeders: Class J, time delay.
- C. Motor Branch Circuits: Class RK1, time delay.
- D. Other Branch Circuits: Class RK5, non-time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.

3.4 IDENTIFICATION

- A. Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

END OF SECTION 16475

SECTION 16476 DISCONNECT SWITCHES

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 individually mounted switches used for the following:
 - 1. Feeder and equipment disconnect switches.
 - 2. Motor disconnect switches.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 16 Section "Fuses" for fuses in fusible disconnect switches.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for disconnect switches and accessories specified in this Section.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain disconnect switches from one source and by a single manufacturer.
- B. Comply with NFPA 70 for components and installation.
- C. Listing and Labeling: Provide disconnect switches specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Switches:
 - a. Cutler Hammer.
 - b. General Electric Co.; Electrical Distribution and Control Division.
 - c. Eaton

2.2 DISCONNECT SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
 1. Outdoor Locations: Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install disconnect switches in locations as indicated, according to manufacturer's written instructions.
- B. Install disconnect switches level and plumb.
- C. Connect disconnect switches and components to wiring system and to ground as indicated and instructed by manufacturer.
 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- D. Identify each disconnect switch according to requirements specified in Division 16 Section "Basic Electrical Materials and Methods."

3.2 FIELD QUALITY CONTROL

- A. Testing: After installing disconnect switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches. Certify compliance with test parameters.
- B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION 16476

SECTION 16511 INTERIOR LIGHTING

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 interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
 - 1. Dimensions of fixtures.
 - 2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 - 3. Emergency lighting unit battery and charger.
 - 4. Fluorescent and high-intensity-discharge ballasts.
 - 5. Types of lamps.

1.4 QUALITY ASSURANCE

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.5 COORDINATION

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 5 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for last four years.
- C. Special Warranties for Fluorescent Ballasts: Written warranty, executed by manufacturer agreeing to replace fluorescent ballasts that fail in materials or workmanship within specified warranty period.
 - 1. Special Warranty Period for Electronic Ballasts: Five years from date of manufacture, but not less than four years from date of Substantial Completion.
 - 2. Special Warranty Period for Electromagnetic Ballasts: Manufacturers' standard warranty, but not less than two years from date of manufacture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the Lighting Fixture Schedule on the drawings.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.
- D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
 - 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
 - 2. Lens Thickness: 0.15 inch minimum, unless greater thickness is indicated.

2.3 FLUORESCENT LAMP BALLASTS

- A. General Requirements: Unless otherwise indicated, features include the following:
 - 1. Designed for type and quantity of lamps indicated at full light output.
 - 2. Total Harmonic Distortion Rating: Less than 20 percent.
 - 3. Sound Rating: A.

- B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
 - 1. Certified Ballast Manufacturer Certification: Indicated by label.
 - 2. Encapsulation: Without voids in potting compound.
 - 3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

- C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:
 - 1. Type: Electronic, fully encapsulated in potting compound.
 - 2. Power Factor: 90 percent, minimum.
 - 3. Operating Frequency: 20 kHz or higher.
 - 4. Flicker: Less than 5 percent.
 - 5. Lamp Current Crest Factor: Less than 1.7.
 - 6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 - 7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

- D. Ballasts for Compact Lamps in Nonrecessed Fixtures: Unless otherwise indicated, additional features include the following:
 - 1. Power Factor: 90 percent, minimum.
 - 2. Ballast Coil Temperature: 65 deg C, maximum.
 - 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
 - 4. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

- E. Ballasts for Low-Temperature Environments: As follows:
 - 1. Temperatures 0 Deg F (Minus 17 Deg C) and Above: Electronic type rated for 0 deg F (minus 17 deg C) starting temperature.
 - 2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Above: Electromagnetic type designed for use with high-output lamps.

- F. Ballasts for Low Electromagnetic Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C for limitations on electromagnetic and radio-frequency interference for consumer equipment.

2.4 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with ANSI C82.4. Unless otherwise indicated, features include the following:
 - 1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
 - 2. Operating Voltage: Match system voltage.

3. Minimum Starting Temperature: **Minus 22 deg F (Minus 30 deg C)** for single lamp ballasts.
 4. Normal Ambient Operating Temperature: **104 deg F (40 deg C)**.
 5. Open-circuit operation that will not reduce average life.
 6. Auxiliary, Instant-on, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- B. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.

2.5 EXIT SIGNS

- A. General Requirements: Comply with UL 924 and the following:
1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.
- B. Internally Lighted Signs: As follows:
1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.6 EMERGENCY LIGHTING UNITS

- A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:
1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
 5. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

2.7 EMERGENCY FLUORESCENT POWER SUPPLY UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
 - 1. Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - 2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life.
 - 3. Charger: Fully automatic, solid-state, constant-current type.
 - 4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamp, and battery is automatically recharged and floated on charger.

2.8 LAMPS

- A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.
- B. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.
- C. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K and 70 CRI, unless otherwise indicated.

2.9 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: **1/2-inch (12-mm)** steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, **1/2-inch (12-mm)** steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- D. Rod Hangers: **3/16-inch- (5-mm-)** minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.10 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than **6 inches (150 mm)** from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two **3/4-inch (20-mm)** metal channels spanning and secured to ceiling tees.
- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than **48 inches (1200 mm)**, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

3.2 CONNECTIONS

- A. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Tests: As follows:
 - 1. Verify normal operation of each fixture after installation.
 - 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
 - 3. Verify normal transfer to battery source and retransfer to normal.
- C. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- D. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16511