Architectural Project Manual

for the

City of Naples
Recycle Transfer Facility

Naples, Florida

July 25, 2012

Disney & Associates
Architects and Planners
AA 0002502

ARCHITECTURAL PROJECT MANUAL

City of Naples
Recycle Transfer Facility

Enterprise Avenue
Naples, Florida

Prepared by

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Naples, Florida 34105

Architect's project number
11-484

Date of issue
July 25, 2012

SECTION 00005

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THE CONTRACTOR IS REQUIRED TO COMPARE THIS PROJECT MANUAL WITH THE INDEX BELOW FOR COMPLETENESS. IF ANY PAGES ARE MISSING OR ILLEGIBLE IT IS HIS RESPONSIBILITY TO REQUEST REPLACEMENTS FROM THE ARCHITECT/ENGINEER.

SPECIFICATION INDEX

RFI FORM

REQUEST FOR INFORMATION:

The bidding Contractors and Subcontractors are cautioned to carefully review plans and project manual for the project. Site visitation is also encouraged as this is a requirement of submitting your bid.

During the bidding process, the Contractor and Subcontractor is encouraged to request clarifications or additional information. To simplify the process and provide the fairest possible distribution of Information to the bidding Contractors, the Architect/Engineer will utilize this "Request for Information" form. The Architect/Engineer will utilize these forms in preparing addenda during the competitive bid process.

To maintain a continuity of information, bidding contractors and subcontractors are requested not to contact consulting Engineers or Architect/Engineer's staff directly for clarification or interpretations, but rather utilize the "Request for Information" process through the Architects office. The use of fax transmission is encouraged to simplify and accelerate the process.

Note: All requests for clarification must be received no later than 7 days prior to bid date.

Date:_____Time:_____

REQUESTING FIRM: _____

INDIVIDUALS' NAME:_____

PHONE NO.:_____FAX NO._____

SUBJECT:_____PAGE/SHEET NO._____

REQUEST FOR CLARIFICATION:_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

SECTION 00430
SUBCONTRACTOR LISTING

TO: The City of Naples, Florida (hereinafter "Owner")

1. Pursuant to bidding requirements for the Work titled:

Recycle Transfer Facility
Naples, Florida

SUBMIT THIS FORM WITH THE BID FOR THE PROJECT.

For portions of the Work listed below, the undersigned proposes to use the following subcontractors:

A. Portion of the Work:	Subcontractor Name & Address:
Testing Laboratory	_____
	_____
	_____
Unit Masonry	_____
	_____
	_____
Concrete Work	_____
	_____
	_____
Metal Building Supplier	_____
	_____
	_____
Metal Building Erector	_____
	_____
	_____

Architectural Woodwork _____

_____

_____

Gypsum and Metal Stud _____

_____

_____

Toilet Accessories _____

_____

_____

Signage _____

_____

_____

Windows glazing _____

_____

_____

Lath and Plaster (Stucco) _____

_____

_____

Acoustical Ceilings _____

_____

_____

Tile _____

_____

_____

Painting _____

_____

_____

Plumbing _____

_____

_____

Fire Protection _____

_____

_____

HVAC _____

_____

_____

Electrical _____

_____

_____

Site Utilities _____

_____

_____

The bidder acknowledges that the Owner may at his option accept or reject any subcontractor listed.

PROVIDE SIGNATURE
IDENTICAL TO THAT SHOWN
ON THE BID FORM

BIDDER:

_____

BY:_____

END OF SECTION

SECTION 00900
ADDENDA

PART 1 - GENERAL

1.1 SCOPE

A. Addenda issued after issue of Bidding and Contract Documents, and prior to Bid Date, are made a part of the Contract Documents as set forth in the General Conditions.

B. Contractor shall incorporate all changes required by the Addenda issued prior to the bid date as set forth in the General Conditions.

C. Contractor shall include all changes in the Contract Price required by and acknowledge receipt of Addenda in his proposal.

l.2 RELATED SECTIONS

A. Section 00100 - Instructions to Bidders and Supplementary Instructions.

B. Section 00301 – Bid Form.

C. Section 00500 – Owner and Contractor Agreement

D. Section 00700 - General Conditions and Supplementary Conditions.

E. Sections of Specifications referenced in Addenda.

END OF SECTION

SECTION 01010
SUMMARY OF THE WORK

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included:
   1. The "Project" of which the "Work" of this Contract is a part, is titled "City of Naples - Recycle Transfer Facility ", and is a one story structure of approximately 15,200 gsf floor area and is to be located on an unimproved site on Enterprise Avenue North of the Naples Airport, in the City of Naples, Collier County, Florida.
   2. The "Work" of this Contract is defined in the Contract Documents to include, but not necessarily to be limited to;

      a. One story structure of approximately 15,200 gsf, floor area, with cast-in-place concrete slab on grade, Pre-Engineered Metal building structure, pre-finished wall panels and portland cement plaster exterior finish, steel stud and gypsum board interior partitions, suspended gypsum board and acoustical tile ceilings, toilet rooms, and air conditioned in part and mechanically ventilated in part.
      b. The site development generally is described and illustrated on separate drawing prepared by the Civil Engineer.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. The work of other contracts is described in various contract documents prepared therefore, some of which are in the possession of the Owner and are available for inspection by interested parties.

C. Utilities:
   1. The contractor shall arrange and pay for all other required and necessary temporary utilities, including but not limited to:
      a) Water
      b) Sewer
      c) Power
      d) Telecommunications
      a) Data communications
      b) Fire protection

D. Other Contractors:
   1. The Owner may contract with other entities to provide additional materials and labor on this project as deemed necessary by the owner at its sole decision. The general contractor shall coordinate rough-in installations of work by others to avoid delays, demolition, and

removal of work of any trade whether under contract with the general contractor or the Owner. The Owner's additional contracts may include any item as the Owner may deem necessary.

E. All references to General Contractor, contractor, sub-contractor, material suppliers or specialty contractor, in relation to the work shall be deemed, for purposes of the Owner/Contractor Agreement as the General Contractor who shall have sole responsibility and control of the distribution of work, and means and methods of construction of the project.

F. All warranties shall commence at the time of the project Substantial Completion as issued by the Architect. The warranty shall be for the time period stated and if not stated shall be for a minimum of ONE (1) year and this requirements shall not reduce a manufacturer's warranty in excess of this minimum requirement.

END OF SECTION

SECTION 01021
CASH ALLOWANCES

PART 1 – GENERAL

1.1 SUMMARY

A. To provide adequate budget and bonding to cover items not precisely determined by the Owner prior to bidding, allow within the proposed Contract Sum the amounts described in this Section.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Other provisions concerning Cash Allowances are stated in Paragraph 4.8 of the General Conditions.
   3. Other provisions concerning Cash Allowances also may be stated in other Sections of these Specifications.

1.2 SPECIFIC CASH ALLOWANCES

A. Gate Systems:
   1. Include within the proposed contract sum the amount of Ten thousand dollars ($10,000) for the purchase and installation of gate motor controls operators, safety loops, keypad and pedestal(s), telephone connections and related wiring and installation.
   2. Gates, fencing, power feeds, boost transformers, conduit and installation of same as indicated on the drawings shall be base bid and not a part of the allowance.
   3. Only at the specific written direction of the Architect and Owner shall items be charged to this account.

B. Truck Scale:
   1. Include within the proposed contract sum the amount of thirty thousand dollars ($30,000) for the relocation and rehabilitation of an existing truck scale.
   2. This allowance shall include scale vendor providing the following scope of work items:
      a. Supply a crane to remove existing scale from foundation and set aside on blocks to allow for sandblasting and painting by the General Contractor.
      b. Design and install new foundations at project site.
      c. Move and install the existing scale at the project site.
      d. Calibrate the truck scale.
      e. Be responsible for all related crane services, pier foundation work, clean-up, form and pour of foundations, concrete approaches, concrete ramps per Fairbanks Scales requirements for certification of the scale installation, relocations, parts and scale related systems for a complete certified working system.
   3. All work not described herein shall be a part of the base bid for a fully functional complete installation of the truck scale including but not limited to survey layout, stakeout, soil supply and placement for foundation, soil supply and placement for ramps,

soil compaction testing, conduits for power and systems, final grade, sidewalks, irrigation, sod and landscaping, coordination/scheduling of the work, underground preparations.

4. Only at the specific written direction of the Architect and Owner shall items be charged to this account.

C. Irrigation System:

1. Include within the proposed contract sum the amount of six thousand five hundred dollars ($6,500) for the installation of an irrigation system for the Project.
2. Contractor shall coordinate with the Owner to review the desired irrigation system for the project, including layout and design specifications.
3. Coordination with a licensed landscape contractor and the design and develop of an irrigation plan for the Project shall be part of the allowance. The Owner shall review and approve the final irrigation plan prior to construction.
4. As indicated on the WilsonMiller-Stantec Code Minimum Landscape and Schematic Irrigation Layout Plans, the irrigation system for the Project shall be designed to support all plant materials surrounding the building structure, parking and pedestrian walkway areas.
5. As indicted on the WilsonMiller-Stantec Code Minimum Plans, the use of temporary irrigation water for plant materials outside of the irrigated area until the plant materials are established shall be part of the base bid and not a part of the allowance.
6. Retrieval of as-built information of the constructed irrigation system and the recording of as-built information on the record drawings shall be part of the base bid and not a part of the allowance.

D. Permanent Utility Service Connection Fees / Infrastructure for Cable, Data, Phone & FPL:

1. Include within the proposed contract sum the amount of Ten thousand dollars ($10,000) for the permanent utility service connection fees and utility provider infrastructure for Cable, Data, Phone and Electric (FPL) for a fully operational facility, including, and not limited to, the following:
    a. Cable, data and phone utility boxes, conduit, wire, pull boxes, etc, and installed by a licensed contractor approved by each utility provider.
    b. Electrical transmission poles and lines, switch gear boxes, transformer and pad, conduit, wire, C/T’s, pull boxes, meter, etc. and installed by Florida Power & Light (FPL).
2. Contractor shall coordinate with the Architect, Architect’s MEP, Civil Engineer and Owner for design, construction documents and necessary paperwork for final coordination on design and infrastructure installation with utility providers.
3. Retrieval of as-built information of the constructed utility infrastructure and the recording of as-built information on the record drawings shall be part of the base bid and not a part of the allowance.

END OF SECTION

SECTION 01026
RELEASE OF LIEN

RELEASE OF LIEN PROCEDURE

Releases of Lien (R.O.L.) shall be required from all subcontractors and material suppliers for items covered by the last draw. These could be partial releases for a defined period of time and/or dollar amounts if the amount of purchase is known and/or the account balance.

Release of Lien shall be required from everyone that has filed a "Notice to Owner".

The Owner reserves the right to require a R.O.L. from any subcontractor and/or material supplier who has not filed a Notice to Owner to assure that they have been paid for all material & labor and/or material covered by a specific invoice and/or draw request from the General Contractor to the Owner*****.

A notarized R.O.L. would be given by the General Contractor to the Architect acting as the Owner's agent, for the invoice and/or draw request amount.

Prior to disbursing any retention monies, the General contractor will be required to furnish final R.O.L.'s from all subcontractors and material suppliers in addition to his own Final Contractors Affidavit.

All lien procedures shall conform to the latest Florida Lien statutes. In case of conflict, Florida statutes will prevail.

The following four pages are the Release of Lien and Contractor's Final Affidavit and Final Release of Lien forms that shall be used for this project.

*****The intent is to protect the Owner in the event that there is some doubt that payments to subcontractors and material suppliers are being properly and timely paid. Normally R.O.L. would not be required.

Forms Attached:

A) Partial Waiver and Release of Lien
B) Waiver and Release of Lien
C) Contractors Final Affidavit and Final Release of Lien

END OF SECTION

PARTIAL WAIVER AND RELEASE OF LIEN

(for providers who have NOT been paid in full)

In consideration of the payment of $_____***** for materials and/or services furnished to

_____ on this order, and

delivered onto and incorporated in the improvement on the real property described as:

I do hereby waive the right to claim and prosecute a lien under the construction lien law of the State of Florida for the above amount on said property for the materials and/or services furnished through

_____

_____

without waiving the right to a lien and enforce same for materials and/or services furnished thereon after said date, or any amount in excess of said amount, this being a PARTIAL LIEN WAIVER. I hereby acknowledge that the statements contained in the foregoing partial release of lien are true and complete.

Dated on _____ 2002.

By:

_____

Name typed
or
printed_____

Company typed
or
printed_____

State of Florida
County of Collier

Sworn to and subscribed before me this _____ day of _____, 200____.

_____
NOTARY PUBLIC
My Commission Expires:

*****Enter total amount released to date, not just amount for the prior release.

WAIVER AND RELEASE OF LIEN

(for providers who have been paid in full)

In consideration of the payment of $_____***** for materials and/or services furnished to

_____ on this order, and

delivered onto and incorporated in the improvement on the real property described as:

I do hereby waive the right to claim and prosecute a lien under the construction lien law of the State of Florida for the above amount on said property for the materials and/or services furnished through

_____

_____

without waiving the right to a lien and enforce same for materials and/or services furnished thereon after said date, this being a LIEN WAIVER and RELEASE OF LIEN. I hereby acknowledge that the statements contained in the foregoing waiver and release of lien are true and complete.

Dated on _____ 200___.

By:
_____

Name typed
or
printed_____

Company typed
or
printed_____

State of Florida
County of Collier

Sworn to and subscribed before me this _____ day of _____, 200___.

_____
NOTARY PUBLIC
My Commission Expires:

*****Enter total amount released to date, not just amount for the prior release.

CONTRACTOR'S FINAL AFFIDAVIT
AND
FINAL RELEASE OF LIEN

STATE OF FLORIDA
COUNTY OF COLLIER

BEFORE ME, the undersigned authority, personally appeared _____, hereinafter the "Affiant", who after being by me first duly sworn, deposes and says that:

1. He is _____ of _____, doing business in the State of Florida, hereinafter called the "Contractor".

2. Contractor pursuant to Contract dated _____, 200___, hereinafter referred to as the "Contract", with _____, hereinafter referred to as the "Owner", has heretofore furnished or caused to be furnished labor, material and services for _____ , as more particularly set forth in the Contract

3. Contractor represents that all work to be performed under the Contract has been fully completed, and all persons and firms who furnished material, labor and/or services incident to the completion of the work have been paid in full except the following (if none, so state):

Name	Address	Amount Due

4. The undersigned affiant, for and in consideration of final payment to the Contractor in the amount of _____ DOLLARS, and all other previous payments paid by Owner to Contractor, does hereby, for and on behalf of the Contractor, waive, release, remise and relinquish the Contractor's right to claim, demand or impose a lien or liens for work done or materials and/or services furnished or any other class of lien whatsoever, on any of the premises owned by Owner on which improvements have been made in connection with the Contract.

5. The affiant hereby represents and warrants that he has authority to execute a full and final release of lien for and on behalf of the Contractor as set forth above.

6. The affiant makes this Affidavit and Release of Lien for the express purpose of inducing the Owner to make final disbursement and payment to the Contractor in the amount of $_____.

7. This Affidavit and Release of Lien is made by affiant with full knowledge of the applicable laws of the State of Florida, including Chapter 713, Florida Statutes (19___). In addition to such rights as may be afforded to the Owner under said applicable laws, affiant expressly agrees to indemnify and save Owner harmless from any and all actual costs and expenses, including reasonable attorneys' fees, arising out of claims by laborers, subcontractors or materialmen who might claim that they have not been paid for services or material furnished by or through the Contractor in connection with the work performed under the Contract.

WITNESS:

For: _____,Inc.

By: _____
Signature

_____
Print Name

_____
Title

STATE OF FLORIDA
COUNTY OF COLLIER

The foregoing was acknowledged before me this _____ day of_____

19____, by _____ as _____

of _____, on behalf of the corporation, personally known to me or did produce _____ as identification, and did take an oath.

_____
NOTARY PUBLIC
My Commission Expires:

SECTION 01027
APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Comply with procedures described in this Section when applying for progress payment and final payment under the Contract.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. The Contract Sum and the schedule for payments are described in the Form of Agreement.
   3. Payments upon Substantial Completion and Completion of the Work are described in the General Conditions and in Section 01700 of these Specifications.
   4. The Architect's approval of applications for progress payment and final payment may be contingent upon the Architect's approval of status of Project Record Documents as described in Section 01720 of these Specifications.

1.2 QUALITY ASSURANCE

A. Prior to start of construction, secure the Architect's approval of the schedule of values and any other item required to be submitted under Paragraph 9.2 of the General Conditions, and further described in Section 01370 of these Specifications.

B. During progress of the Work, modify the schedule of values only as approved by the Architect to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.

C. Base requests for payment on the approved schedule of values.

1.3 PROCEDURES

A. Informal Submittal:
   1. Unless otherwise directed by the Architect -
      a) Make an informal submittal of request for payment by filling in, pertinent portions of AIA Document G702, "Application and Certificate for Payment", plus continuation sheet or sheets.
      b) Make this preliminary submittal to the Architect at the last regular job meeting of each month, but not later than the 25th of the month.

c) Revise the informal submittal of request for payment as agreed at the job meeting, initialing all copies.

d) Payment for stored materials off site shall not be allowed.

B. Formal Submittal:

1. Unless otherwise directed by the Architect -

a) Make formal submittal of request for payment by filling in the agreed data, by typewriter on AIA Document G702, “Application and Certificate for Payment”, plus continuation sheet or sheets.

b) Sign, seal and notarize the Application and Certificate for Payment.

c) Submit the original of the Application and Certificate for Payment, plus four identical copies to the Architect, including the appropriate, lien releases, invoices for stored materials, listing of subcontractors and suppliers to be paid from the current Application and Certificate for payment. The first application shall include a cash flow projection, by month, for the duration of the project, for the Owner’s use.

d) The Architect will compare the formal submittal with the reviewed informal submittal and, when reviewed, will sign the Application and Certificate for Payment, and will distribute:

i. One copy to Contractor

ii. Two copies to Owner

iii. One copy to Architect’s file

e) Owner will, upon approval by the owner, disburse payment directly to the Contractor.

END OF SECTION

SECTION 01028
CHANGE ORDER PROCEDURE

PART 1 – GENERAL

1.1 SUMMARY

A. Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as are described in written Change Orders signed by the Owner and the Architect and issued after execution of the Contract, in accordance with the provisions of this Section.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Changes in the Work are described further in the General Conditions.
   3. Architect's Supplemental Instructions -
      a) From time to time during progress of the Work, the Architect may issue supplemental instructions which interpret the Contract Documents or order minor changes in the Work without change in Contract Sum or Contract Time.
      b) Should the Contractor consider that a change in Contract Sum or Contract Time is required, he shall submit an itemized proposal to the Architect immediately and before proceeding with the Work. If the proposal is found to be satisfactory and in proper order, the supplemental instructions in that event will be superseded by a Change Order.
   4. Proposal Requests -
      a) From time to time during progress of the Work the Architect may issue a proposal request for an itemized quotation for changes in the Contract Sum and/or Contract Time incidental to proposed modifications to the Contract Documents.
      b) This will not be a Change Order, and will not be a direction to proceed with the changes described therein.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Maintain a "Register of proposal requests, supplemental instructions, and Change Orders" at the job site, accurately reflecting current status of all pertinent data.

B. Make the Register available to the Architect for review at his request.

1.4 PROCESSING PROPOSAL REQUESTS

A. Make written reply to the Architect in response to each proposal request
   1. State proposed change in the Contract Sum, if any.
   2. State proposed change in the Contract Time of completion, if any.
   3. Clearly describe other changes in the Work, if any, required by the proposed change or desirable therewith.
   4. Include full backup data such as subcontractor's letter of proposal or similar information.
   5. Submit this response in single copy.
   6. Full and complete labor and material breakdown shall be provided.

B. When cost or credit for the change has been agreed upon by the Owner and the Contractor, or the Owner has directed that cost or credit be determined in accordance with provisions of the General Conditions, the Architect will issue a Change Order to the Contractor.

1.5 PROCESSING CHANGE ORDERS

A. Change Orders will be numbered in sequence, and dated.
   1. The Change Order will describe the change or changes, will refer to the proposal requests or supplemental instructions involved, and will be signed by the Owner and the Architect.
   2. The Architect will issue four copies of each Change Order to the Contractor.
      a) The Contractor promptly shall sign all four copies and return three copies to the Architect.
      b) The Architect will retain one signed copy in his file, will forward one signed copy to the Owner, and will forward one signed copy to the Lender.

END OF SECTION

SECTION 01045
CUTTING AND PATCHING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the Work required to:
   1. Make the several parts fit properly;
   2. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
   3. Remove and replace work not conforming to requirements of the Contract Documents; and
   4. Remove and replace defective work.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. In addition to other requirements specified, upon the Architect's request uncover work to provide for inspection by the Architect of covered work, and remove samples of installed materials for testing.
   3. Do not cut or alter work performed under separate contracts without the Architect's written permission.

1.2 SUBMITTALS

A. Request for Architect's consent:
   1. Prior to cutting which effects structural safety, submit written request to the Architect for permission to proceed with cutting.
   2. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Architect and secure his written permission and the required Change Order prior to proceeding.

B. Notices to the Architect:
   1. Prior to cutting and patching performed pursuant to the Architect's instructions, submit cost estimate to the Architect. Secure the Architect's approval of cost estimates and type of reimbursement before proceeding with cutting and patching.
   2. Submit written notice to the Architect not less than 24 hours in advance, designating the time the Work will be uncovered, to provide for the Architect's observation.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 – PRODUCTS

2.1 MATERIALS

A. For replacement of items removed, use materials complying with pertinent Sections of these Specifications.

2.2 PAYMENT FOR COSTS

A. The Owner will reimburse the Contractor for cutting and patching performed pursuant to a written Change Order, after claim for such reimbursement is submitted by the Contractor. Perform other cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
   1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching, and backfilling.
   2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:
   1. If uncovered conditions are not as anticipated, immediately notify the Architect and secure needed directions.
   2. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION PRIOR TO CUTTING

A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

3.3 PERFORMANCE

A. Performance required excavating and backfilling as required under pertinent other Sections of these Specifications.
   1. Perform cutting and demolition by methods which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.
   2. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
   1. Establishing and maintaining lines and levels.
   2. Structural design of shores, forms, and similar items provided by the Contractor as part of his means and methods of construction.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Additional requirements for field engineering also may be described in other Sections of these Specifications.
   3. As described in the General Conditions, the Owner will furnish survey describing the physical characteristics, legal limitations, utility locations, and legal description of the site.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Upon request of the Architect, submit:
   1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
   2. Documentation verifying accuracy of field engineering work.
   3. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 PROCEDURES

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
   1. Locate and protect control points before starting work on the site.
   2. Preserve permanent reference points during progress of the Work.

3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
4. Promptly advise the Architect when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
    a) Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
    b) Locate such replacements according to the original survey control.

END OF SECTION

SECTION 01095
REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

General: Basic Contract definitions are included in the Conditions of the Contract.

Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

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

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

Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as

"carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

Publication Dates: Comply with the standard in effect as of the date of the Contract Documents.

Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels. Refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding. It is presumed that the most restrictive and/or the most expensive of the requirements shall prevail.

Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum

quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.

Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.

Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AA Aluminum Association
900 19th St., NW, Suite 300
Washington, DC 20006 (202) 862-5100

AABC Associated Air Balance Council
1518 K St., NW, Suite 503
Washington, DC 20005 (202) 737-0202

AAMA American Architectural Manufacturers Assoc.
2700 River Rd., Suite 118
Des Plaines, IL 60018 (312) 699-7310

AAN American Association of Nurserymen
1250 Eye St., NW, Suite 500
Washington, DC 20005 (202) 789-2900

AASHTO American Association of State Highway
and Transportation Officials
444 North Capitol St., Suite 225
Washington, DC 20001 (202) 624-5800

ACI American Concrete Institute
P.O. Box 19150
Detroit, MI 48219 (313) 532-2600

ACIL American Council of Independent Laboratories

	1725 K St., NW Washington, DC 20006 (202) 887-5872	
ACPA	American Concrete Pipe Assoc. 8300 Boone Blvd., Suite 400 Vienna, VA 22180 (703) 821-1990	
ADC	Air Diffusion Council 230 N. Michigan Ave., Suite 1200 Chicago, IL 60601 (312) 372-9800	
AFBMA	Anti-Friction Bearing Manufacturers Assoc. 1101 Connecticut Ave., N.W., Suite 700 Washington, DC 20036 (202) 429-5155	
AGA	American Gas Assoc. 1515 Wilson Blvd. Arlington, VA 22209 (703) 841-8400	
AHA	American Hardboard Assoc. 520 N. Hicks Rd. Palatine, IL 60067 (312) 934-8800	
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Drive Chicago, IL 60606 (312) 984-5800	
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052	(606) 288-4960
AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006 (202) 626-7300	
AISC	American Institute of Steel Construction One East Waker Drive, Suite 3100 Chicago, IL 60601-2001 (312) 670-2400	
AISI	American Iron and Steel Institute 1133 Fifteenth St., NW Washington, DC 20005 (202) 452-7100	
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20874 (301) 972-1700	
AMCA	Air Movement and Control Assoc.	

30 W. University Drive
Arlington Heights, IL 60004 (312) 394-0150

ANSI American National Standards Institute
1430 Broadway
New York, NY 10018 (212) 354-3300

AOSA Association of Official Seed Analysts
c/o Jim Lair
Illinois Department of Agriculture Seed Lab.
Box 19281
Springfield, IL 62794 (217) 782-7655

APA American Plywood Assoc.
P.O. Box 11700
Tacoma, WA 98411 (206) 565-6600

API American Petroleum Institute
1220 L St., NW
Washington, DC 20005 (202) 682-8000

ARI Air Conditioning and Refrigeration Institute
1501 Wilson Blvd., 6th Floor
Arlington, VA 22209 (703) 524-8800

ARMA Asphalt Roofing Manufacturers Assoc.
6288 Montrose Rd.
Rockville, MD 20852 (301) 231-9050

ASA Acoustical Society of America
500 Sunnyside Blvd.
Woodbury, NY 11797 (516) 349-7800

ASC Adhesive and Sealant Council
1627 K Street, NW, Suite 1000
Washington, DC 20006 (202) 452-1500

ASHRAE American Society of Heating, Refrigerating
and Air-Conditioning Engineers
1791 Tullie Circle, NE
Atlanta, GA 30329 (404) 636-8400

ASME American Society of Mechanical Engineers
345 East 47th St.
New York, NY 10017 (212) 705-7722

ASPE American Society of Plumbing Engineers

	3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362 (805) 495-7120
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140 (216) 835-3040
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103 (215) 299-5400
AWI	Architectural Woodwork Institute 2310 S. Walter Reed Drive Arlington, VA 22206 (703) 671-9100
AWS	American Welding Society 550 LeJeune Road, NW P.O. Box 351040 Miami, FL 33135 (305) 443-9353
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd. Schaumburg, IL 60173 (312) 517-1200
CTI	Ceramic Tile Institute of America 700 N. Virgil Ave. Los Angeles, CA 90029 (213) 660-1911
DHI	Door and Hardware Institute 7711 Old Springhouse Rd. McLean, VA 22102 (703) 556-3990
DLPA	Decorative Laminate Products Assoc. 600 S. Federal St., Suite 400 Chicago, IL 60605 (312) 922-6222
EIMA	Exterior Insulation Manufacturers Assoc. 30 Holley St. Wakefield, RI 02879 (401) 782-3687
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591 (914) 332-0040
ETL	ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045 (607) 753-6711

FCI	Fluid Controls Institute P.O. Box 9036 Morristown, NJ 07960 (201) 829-0990
FGMA	Flat Glass Marketing Assoc. White Lakes Professional Bldg. 3310 Harrison Topeka, KS 66611 (913) 266-7013
FM	Factory Mutual Research Organization 1151 Boston-Providence Turnpike Norwood, MA 02062 (617) 762-4300
FTI	Facing Tile Institute P.O. Box 8880 Canton, OH 44711 (216) 488-1211
GA	Gypsum Association 810 First Street, NE, Suite 510 Washington, DC 20002 (202) 289-5440
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, MA 02664 (508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 1430 Broadway New York, NY 10018 (212) 354-3300
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th St. New York, NY 10017 (212) 705-7900
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017 (212) 705-7926
LIA	Lead Industries Association, Inc. 292 Madison Avenue New York, NY 10017 (212) 578-4750
LPI	Lightning Protection Institute P.O. Box 1029 Woodstock, IL 60098 (815) 337-0277
MCAA	Mechanical Contractors Association of America

1385 Piccard Dr.
Rockville, MD 20832 (301) 869-5800

ML/SFA Metal Lath/Steel Framing Assoc.
(A Division of the National Association
of Architectural Metal Manufacturers)
600 S. Federal St., Suite 400
Chicago, IL 60605 (312) 922-6222

MSS Manufacturers Standardization Society of
the Valve and Fittings Industry
127 Park St., NE
Vienna, VA 22180 (703) 281-6613

NAAMM National Association of Architectural
Metal Manufacturers
600 S. Federal St., Suite 400
Chicago, IL 60605 (312) 922-6222

NAPA National Asphalt Pavement Assoc.
Calvert Building, Suite 620
6811 Kenilworth Ave.
Riverdale, MD 20737 (301) 779-4880

NBHA National Builders Hardware Assoc.
(Now DHI)

NCMA National Concrete Masonry Assoc.
P.O. Box 781
Herndon, VA 22070 (703) 435-4900

NEC National Electric Code (from NFPA)

NECA National Electrical Contractors Assoc.
7315 Wisconsin Ave.
Bethesda, MD 20814 (301) 657-3110

NEII National Elevator Industry, Inc.
185 Bridge Plaza, North
Fort Lee, NJ 07024 (201) 944-3211

NEMA National Electrical Manufacturers Assoc.
2101 L St., NW, Suite 300
Washington, DC 20037 (202) 457-8400

NFPA National Fire Protection Assoc.
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101 (617) 770-3000

NLGA National Lumber Grades Authority
1055 W. Hastings St., Suite 260
Vancouver, British Columbia
Canada V6E 2E9 (604) 687-2171

NPCA National Paint and Coatings Assoc.
1500 Rhode Island Ave., NW
Washington, DC 20005 (202) 462-6272

NRCA National Roofing Contractors Assoc.
One O'Hare Centre
6250 River Road, Suite 8030
Rosemont, IL 60018 (708) 318-6722

NSF National Sanitation Foundation
3475 Plymouth Rd.
P.O. Box 1468
Ann Arbor, MI 48106 (313) 769-8010

NSSEA National School Supply and Equipment Assoc.
2020 Fourteenth St. North, Suite 400
Arlington, VA 22201 (703) 524-8819

NTMA National Terrazzo and Mosaic Assoc.
3166 Des Plaines Ave., Suite 132
Des Plaines, IL 60018 (312) 635-7744

NWMA National Woodwork Manufacturers Assoc.
(Now NWWDA)

NWWDA National Wood Window and Door Assoc.
(Formerly NWMA)
1400 E. Touhy Ave., #G54
Des Plaines, IL 60018 (312) 299-5200

PCA Portland Cement Assoc.
5420 Old Orchard Road
Skokie, IL 60077 (312) 966-6200

PCI Prestressed Concrete Institute
175 W. Jackson Blvd.
Chicago, IL 60604 (312) 786-0300

RFCI Resilient Floor Covering Institute
966 Hungerford Drive, Suite 12-B
Rockville, MD 20805 (301) 340-8580

S.D.I. Steel Door Institute

30200 Detroit Road
Cleveland, OH, 44145 (216) 889-0010

SGCC Safety Glazing Certification Council
c/o ETL Testing Laboratories
Route 11, Industrial Park
Cortland, NY 13045 (607) 753-6711

SHLMA Southern Hardwood Lumber Manufacturers Assoc.
(Now HMA)

SMACNA Sheet Metal and Air Conditioning
Contractors National Association
P.O. Box 70
Merrifield, VA 22116 (703) 790-9890

SPIB Southern Pine Inspection Bureau
4709 Scenic Highway
Pensacola, FL 32504 (904) 434-2611

TCA Tile Council of America
P.O. Box 326
Princeton, NJ 08542 (609) 921-7050

TIMA Thermal Insulation Manufacturers Assoc.
29 Bank Street
Stamford, CT 06901 (203) 324-7533

UL Underwriters Laboratories
333 Pfingsten Rd.
Northbrook, IL 60062 (708) 272-8800

WRI Wire Reinforcement Institute
1760 Reston Parkway, Suite 403
Reston, VA 22090 (703) 790-9790

WSC Water Systems Council
600 S. Federal St., Suite 400
Chicago, IL 60605 (312) 922-6222

WWPA Western Wood Products Assoc.
Yeon Building
522 SW 5th Avenue
Portland, OR 97204-2122 (503) 224-3930

W.W.P.A. Woven Wire Products Assoc.
2515 N. Nordica Ave.
Chicago, IL 60635 (312) 637-1359

Federal Government Agencies: Names and titles of federal government standard or Specification producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or Specification producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CE Corps of Engineers
(U.S. Department of the Army)
Chief of Engineers - Referral
Washington, DC 20314 (202) 272-0660

CFR Code of Federal Regulations
Available from the Government Printing Office
N. Capitol St. between G and H St. NW
Washington, DC 20402 (202) 783-3238
(Material is usually first published
in the "Federal Register")

CPSC Consumer Product Safety Commission
5401 Westbard Ave.
Bethesda, MD 20816 (800) 638-2772

CS Commercial Standard
(U.S. Department of Commerce)
Government Printing Office
Washington, DC 20402 (202) 377-2000

DOC Department of Commerce
14th St. and Constitution Ave., NW
Washington, DC 20230 (202) 377-2000

DOT Department of Transportation
400 Seventh St., SW
Washington, DC 20590 (202) 366-4000

EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460 (202) 382-2090

FCC Federal Communications Commission
1919 M St., NW
Washington, DC 20554 (202) 632-7000

FS Federal Specification (from GSA)
Specifications Unit (WFSIS)
7th and D St., SW
Washington, DC 20406 (202) 472-2205or 472-2140

GSA General Services Administration
F St. and 18th St., NW
Washington, DC 20405 (202) 472-1082

NIST National Institute of Standards and Technology
(U.S. Department of Commerce)
Gaithersburg, MD 20899 (301) 975-2000

OSHA Occupational Safety and Health Administration
(U.S. Department of Labor)
Government Printing Office
Washington, DC 20402 (202) 523-6091

USPS U.S. Postal Service
475 L'Enfant Plaza, SW
Washington, DC 20260 (202) 268-2000

1.3 GOVERNING REGULATIONS/AUTHORITIES

The Architect has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.

1.4 SUBMITTALS

Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200
PROJECT MEETINGS

PART 1 – GENERAL

1.1 SUMMARY

A. To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Architect will conduct project meetings throughout the construction period.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.2 SUBMITTALS

A. Agenda Items:
   1. To the maximum extent practicable, advise the Architect at least 24 hours in advance of project meetings regarding items to be added to the agenda.

B. Minutes:
   1. The Contractor will compile type written minutes of each project meeting, and will furnish two copies to the Architect within three days of the meeting occurrence. In the event the Contractor fails to issue the meeting minutes as outlined the Architect shall compile and type the meeting minutes and the Contractor shall reimburse the Architect for the time expended at triple the Architect Normal hourly rates. The Architect shall compile minutes of the pre-construction conference.
   2. Contractor may make copies and distribute such other copies as he wishes.

1.3 QUALITY ASSURANCE

A. For those persons designated by the Contractor, his subcontractors, and suppliers to attend the Preconstruction Conference, provide required authority to commit the entities they represent to solutions agreed upon in the Conference.

PART 2 – PRODUCTS

(No products are required in this Section)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

A. Except as noted below for Preconstruction Meeting, project meetings will be held bi-weekly.

B. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

A. The Architect will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.3 PRECONSTRUCTION MEETING

A. Preconstruction Meeting will be scheduled to be held within 15 working days after the Owner has issued the Notice to Proceed.
   1. Provide attendance by authorized representatives of the Contractor and major subcontractors.
   2. The Architect will advise other interested parties, including the Owner, and request their attendance.

B. Minimum Agenda:
   1. Data will be distributed and discussed on at least the following items -
      a) Organizational arrangement of Contractor's forces and personnel, and those of subcontractors, materials suppliers, and Architect.
      b) Channels and procedures for communications.
      c) Construction schedule, including sequence of critical work.
      d) Contract Documents, including distribution of required copies of original documents and revisions.
      e) Processing of Shop Drawings and other data submitted to the Architect for review.
      f) Processing of Bulletins, field decisions, and Change Orders.
      g) Rules and regulations governing performance of the Work.
      h) Procedures for safety and first aid, security, quality control, housekeeping and related matters.

3.4 PROJECT MEETINGS

A. Attendance:
   1. To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work.
   2. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspect of the Work is involved.

B. Minimum Agenda:
   1. Review, revise as necessary, and approve minutes of previous meetings.
   2. Review progress of the Work since last meeting, including status of submittals for approval and project schedule.
   3. Identify problems that impede planned progress.
   4. Develop corrective measures and procedures to regain planned schedule.
   5. Complete other current business.

C. Revisions to Minutes:
    1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
    2. Challenge to minutes shall be settled as priority portions of “old business” at the next regularly scheduled meeting.

END OF SECTION

SECTION 01310
PROGRESS SCHEDULES

PART 1 – GENERAL

1.1 SUMMARY

A. To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Architect in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, prepare and maintain the schedules and reports described in this Section.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Requirements for progress schedule: General Conditions.
   3. Construction period: Form of Agreement.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Preliminary Analysis:
   1. Within ten calendar days after the Contractor has received the Owner's Notice to Proceed, submit one reproducible copy and four prints of a preliminary construction schedule prepared in accordance with Part 3 of this Section.

C. Construction Schedule:
   1. Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit one reproducible copy and four prints of a construction schedule prepared in accordance with Part 3 of this Section.

D. Periodic Reports:
   1. Concurrent with the Payment Applications of each month following the submittal described in Paragraph 1.2-C above, submit four prints of the construction schedule updated as described in Part 3 of this Section.

1.3 QUALITY ASSURANCE

A. Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, and in preparing and issuing periodic reports as required below.

B. Perform data preparation, analysis, charting, and updating in accordance with standards approved by the Architect.

C. Reliance upon the approved schedule:
   1. The construction schedule as reviewed by the Architect and approved by the Owner, will be an integral part of the Contract and will establish interim completion dates for the various activities under the Contract.
   2. Should any activity not be completed within 15 days after the stated scheduled data, the Owner shall have the right to require the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor.
   3. Should any activity be 30 days or more behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner deems appropriate.
   4. Costs incurred by the Owner and by the Architect in connection with expediting construction activity under this Article shall be reimbursed by the Contractor.
   5. It is expressly understood and agreed that failure by the Owner to exercise the option either to order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered to set a precedent for any other activities.

PART 2 - PRODUCTS

2.1 CONSTRUCTION ANALYSIS

A. Graphically show by bar-chart, or other means acceptable to the Architect, the order and interdependence of all activities necessary to complete the Work, and the general sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram.

B. Include, but do not necessarily limit indicated activities to:
   1. Project mobilization
   2. Project phasing
   3. Submittal and approval of Shop Drawings and Samples.
   4. Procurement of equipment and critical materials.
   5. Fabrication of special material and equipment, and its installation and testing.
   6. Final cleanup
   7. Final inspecting and testing
   8. All activities by the Architect that effect progress, required dates for completion, or both, for all and each part of the Work.

PART 3 - EXECUTION

3.1 PRELIMINARY ANALYSIS

A. Contents:
   1. Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of construction schedule required under Paragraph 1.2-C above.
   2. Show the Contractor’s general approach to remainder of the Work.

3.2 CONSTRUCTION SCHEDULE

A. As required under Paragraph 1.2-D above, update the approved construction schedule.
   1. Indicate “actual” progress in percent completion for each activity.
   2. Provide written narrative summary of revisions causing delay in the program, and an explanation of corrective actions taken or proposed.

3.3 REVISIONS

A. Make only those revisions to approved construction schedule as are approved in advance by the Architect.

END OF SECTION

SECTION 01340
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 – GENERAL

1.1 SUMMARY

A. Make submittals required by the Contract Documents, and revise and resubmit as necessary to establish compliance with the specified requirements, all as described in this Section.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Individual requirements for submittals also may be described in pertinent Sections of these Specifications.
3. The process for securing approval of proposed substitutions is described in Section 01630 – Product Options and Substitutions.

C. Work Not Included:

1. Unrequired submittals will not be reviewed by the Architect.
2. The Contractor may require his subcontractors to provide drawings, setting diagrams, and similar information to help coordinate the Work, but such data shall remain between the Contractor and his subcontractors and will not be reviewed by the Architect unless specifically called for within the Contract Documents.

1.2 SUBMITTALS

A. Make submittals of Shop Drawings, Samples, substitution requests, and other items in accordance with the provisions of this Section.

1.3 QUALITY ASSURANCE

A. Coordination of submittals:

1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted.
2. Verify that each item and the submittal for it conform in all respects with the specified requirements.
3. Affix the Contractor's review stamp and signature to each submittal, certifying that this coordination has been performed.

1.4 REIMBURSEMENT OF ARCHITECT'S COSTS

A. In the event submittals are reviewed and rejected, and the subsequent resubmittal is not properly corrected by the contractor, and the Architect rejects the submittal upon the second review, the Architect will record all time used by the Architect and the Architect's consultants in evaluating each such subsequent submittal.

B. Whether or not the Architect approves subsequent submittals of the same item, the Contractor promptly upon receipt of the Architect's billing shall reimburse the Architect at the rate of three (3) times the direct cost to the Architect and the Architect's consultants for all time spent by them in reviewing the third and subsequent submissions of the same item(s).

PART 2 – PRODUCTS

2.1 SHOP DRAWINGS

A. Scale and measurements
   1. Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

B. Types of prints required:
   1. Submit Shop Drawings in the form of six sets of each submittal and product data.

C. Review comments of the Architect will be shown on a separate review comment form and returned with the reviewed item. The Contractor may make and distribute such copies as are required for his purposes.

D. Architects AutoCAD files for use in the preparation of submittals shall be requested by the individual vendor or sub-contractor directly to the Architect. The vendor or sub-contractor shall be required to identify the individual drawing plan or building section sheets requested and shall not be provided a complete set of drawings. Details / schedules shall not be released and Architects title block shall be deleted. A release form shall be provided by the Architect and shall be signed and returned to the Architect from each requesting vendor or sub-contractor with advance payment for the reproduction services. The cost per disk shall be the Architect's normal charge of $200 each. The release is individual to each user and specifies the use rights are extended only to the requestor and sharing of the files is not allowed. The Architect shall provide a CD-ROM disk for pick-up at the Architects office or prepaid FedEx / UPS pick-up. Email of files will not be provided.

2.2 MANUFACTURERS' LITERATURE

A. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portion of the contents is being submitted for review.

B. Submit the number of copies which are required to be returned, plus two copies which will be retained by the Architect.

2.3 SAMPLES

A. Provide Sample or Samples identical to the precise article proposed to be provided. Identify as described under "Identification of Submittals" below.

B. Number of Samples required:
   1. Unless otherwise specified, submit Samples in the quantity that is required to be returned, plus one that will be retained by the Architect.

2. By prearrangement in specific cases, a single Sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Architect.

2.4 COLORS AND PATTERNS

A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate color and pattern charts to the Architect for selection.

PART 3 – EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

A. Consecutively number all submittals.
   1. When material is submitted for any reason, transmit under a new letter of transmittal and with a new transmittal number.
   2. On resubmittals, cite the original submittal number for reference.

B. Accompany each submittal with a letter of transmittal showing all information required for identification and checking.

C. On at least the first page of each submittal, and elsewhere as required for positive identification, show the submittal number in which the item was included.

D. Submittal Log:
   1. The Contractor shall maintain an accurate submittal log for the duration of the Work, showing current status of all submittals at all times.
   2. Make the submittal log available to the Architect for the Architect's review upon request.

3.2 GROUPING OF SUBMITTALS

A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
   1. Partial submittals may be rejected as not complying with the provisions of the Contract.
   2. The Contractor may be held liable for delays so occasioned.

3.3 TIMING OF SUBMITTALS

A. Make submittals far enough in advance of scheduled date for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.

B. In scheduling, allow at least ten working days for review by the Architect following the Architect's receipt of the submittal.

C. In the event of large submittals, prioritize the submittals for the Architect's review.

3.4 REQUIRED SUBMITTALS

A. Submittals required by the Contract Documents are listed in the text of this project manual.

END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 SUMMARY

A. Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Preparation and submittal of a schedule of values is required by the General Conditions.
   3. Schedule of values is required to be compatible with the "continuation sheet" accompanying applications for payment, as described in Section 01027.

1.2 SUBMITTALS

A. Not more than ten (10) day after the issuance of the Notice to Proceed but prior to first application for payment, submit a proposed schedule of values to the Architect.
   1. Meet with the Architect and determine additional data, if any, required to be submitted.
   2. Submit break down the identifies rough, underground, and finish work separately.
   3. Secure the Architect's approval of the schedule of values prior to submitting first application for payment.

1.3 QUALITY ASSURANCE

A. Use required means to assure arithmetical accuracy of the sums described.

B. When so requested by the Architect, provide copies of the subcontracts or other data acceptable to the Architect, substantiating the sums described.

C. Provide adequate line items to define costs for rough, finished, trim with labor and materials separately identified for all listings.

END OF SECTION

SECTION 01380
CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 SUMMARY

A. Employ competent photographer to take construction record photographs periodically during course of the work.

B. Related Sections
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 PHOTOGRAPHY REQUIRED

A. Provide photographs taken on cutoff date for each scheduled Application for Payment.

B. Views and Quantities Required:
1. At each specified time, photograph Project from three (3) different views, as approved by Architect.
2. Provide three (3) prints of each view.

C. Negatives:
1. Remain property of photographer.
2. Require that photographer maintain negatives for a period of two (2) years from Date of Substantial Completion of entire Project.
3. Photographer shall agree to furnish additional prints to Owner and Architect at commercial rates applicable at time of purchase.

1.3 COSTS OF PHOTOGRAPHY

A. Pay costs for specified photography and prints:
1. Parties requiring additional photography or prints will pay photographer directly.

PART 2 - PRODUCTS

2.1 PRINTS

A. Color:
1. Paper: Single weight..
2. Finish: Smooth surface, glossy.
3. Size: 8" x 10" minimum.

B. Identify each print on back, listing:
   1. Name of Project.
   2. Orientation of view.
   3. Date and time of exposure.
   4. Name and address of photographer.

PART 3 - EXECUTION

3.1 TECHNIQUE

A. Factual presentation.

B. Correct Exposure and Focus:
   1. High resolution and sharpness.
   2. Maximum depth-of-field.
   3. Minimum distortion.

3.2 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate condition of construction and state of progress.
   1. At successive period of photography, take all three (3) photographs from the same overall view.
   2. Consult with Architect at each period of photography for instructions concerning special or differing views required.

3.3 DELIVERY OF PRINTS

A. Deliver prints to Architect to accompany each Application for Payment.

END OF SECTION

SECTION 01400 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

RELATED DOCUMENTS:

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

DESCRIPTION OF REQUIREMENTS:

General: Required inspection and testing services are intended to assist in the determination of probable compliance of the work with requirements specified or indicated. These required services do not relieve the General Contractor of responsibility for compliance with these requirements or for compliance with requirements of the contract documents.

Definitions: The requirements of this section relate primarily to customized fabrication and installation procedures, not to the production of standard products. Quality control services include inspections and tests and related actions including reports, performed by independent agencies and governing authorities, as well as directly by the General Contractor. These services do not include Contract enforcement activities performed directly by the Architect or Engineer.

> Specific quality control requirements for individual units of work are specified in the section of these specifications that specify the individual element of the work. These requirements, including inspections and tests, cover both production of standard products, and fabrication of customized work. These requirements also cover quality control of the installation procedures.
>
> Inspections, tests and related actions specified in this section and elsewhere in the contract documents are not intended to limit the General Contractor's own quality control procedures which facilitate overall compliance with requirements of the contract documents.
>
> Requirements for the General Contractor to provide quality control services as required by the Architect/Engineer, the Owner, governing authorities or other authorized entities are not limited by the provisions of this section.

RESPONSIBILITIES:

General Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the **General Contractor**'s responsibility; these services also include those specified to be performed by an independent agency and not directly by the **General Contractor**. Costs for these services shall be included in the Contract Sum. The **General Contractor** shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

The Owner will engage and pay for the services of an independent agency to perform inspections and tests that are specified as the Owner's responsibility.

Owner Responsibilities: Except where they are specifically indicated as being the **General Contractor**'s responsibility, or where they are to be provided by another identified entity, inspection, tests and similar quality control services specified to be performed by independent agencies and not directly by the **General Contractor**, are the Owner's responsibility. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility. Those tests shall include; Soils Compaction, Soils Moisture Content, Concrete and Structural Weld Testing.

Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with the requirements of the contract documents, then retests are the responsibility of the **General Contractor**, regardless of whether the original test was the General Contractor's responsibility. Retest the work revised or replaced by the General Contractor is the General Contractor's responsibility, where required tests were performed on original work.

Responsibility for Associated Services: The General Contractor is required to cooperate with the independent agencies performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of samples to test laboratories.
4. Security and protection of samples and test equipment at the project site.

Coordination: The General Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition the General Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests. The General Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

QUALITY ASSURANCE:

Qualification for Service Agencies: Except as otherwise indicated, engage inspection and test service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which are recognized in the industry as specialized in the types of inspections and tests to be performed.

SUBMITTALS:

General: Refer to Division-1 section on "Submittals" for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer, in

duplicate, unless the General Contractor is responsible for the service. If the General Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the General Contractor, in duplicate. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

1) **Report Data:** Written reports of each inspection, test or similar service shall include, but not be limited to the following:

   a) Name of testing agency or test laboratory.
   b) Dates and locations of samples and tests or inspections.
   c) Names of individuals making the inspection or test.
   d) Designation of the work and test method.
   e) Complete inspection or test data.
   f) Test results.
   g) Interpretations of test results.
   h) Notation of significant ambient conditions at the time of sample-taking
      i) and testing.
   i) Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents.
   j) Recommendations on retesting, if applicable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

REPAIR AND PROTECTION:

General: Upon completion of inspection, testing, sample-taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the contract document requirements for "Cutting and Patching". Protect work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the General Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01410
TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes testing and inspecting to be provided by the Contractor, plus cooperation required from the Contractor with the Owner's selected testing agency and others responsible for additional testing and inspection of the Work.
B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Requirements for testing may be described in various Sections of these Specifications.
   3. Where no testing requirements are described, but the Owner decides that testing is required, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described in this Section.

1.2 QUALITY ASSURANCE

A. The testing laboratory will be qualified to the Owner's approval in accordance with ASTM E329.
B. Testing, when required, will be in accordance with all pertinent codes and regulations, and with selected standards of the American Society for Testing and Materials. Included are tests for soil compaction, concrete testing and mortar testing, weld testing and observation of bolt tightening.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.
B. Promptly process and distribute required copies of test reports and related instructions to assure necessary re-testing and replacement of materials with the least possible delay in progress of the Work.

PART 2 - PRODUCTS

2.1 PAYMENT FOR TESTING

A. Initial services of testing laboratory:
   1. The Contractor shall pay for initial testing services.
   2. When initial tests indicate noncompliance with the Contract Documents, the costs of all tests associated with that noncompliance will be paid by the Contractor.
B. Retesting:
   1. When initial tests indicate noncompliance with the Contract Documents, subsequent retesting occasioned by the noncompliance shall be performed by the same testing agency, and costs thereof will be paid by the Contractor.

2.2 CODE COMPLIANCE TESTING

A. Inspections and tests required by codes or ordinances, or by a plan approval authority, and which are made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Contractor.

2.3 CONTRACTOR'S CONVENIENCE TESTING

A. Inspecting and testing performed exclusively for the Contractor's convenience shall be the sole responsibility and expense of the Contractor.

2.4 MINIMUM REQUIRED TESTING

A. Concrete Testing
   1. ASTM C143 – "Standard Test Method for Slump of Portland Cement Concrete". Maximum slump shall be in accordance with the approved Concrete Mix Design.
   2. ASTM C39 _ "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens". Samples for strength tests for each class of concrete placed each day shall not be taken less than once a day, nor less than once for each fifty (50) cubic yards of concrete nor less than once for each 2,500 square feet of surface area for slabs and walls. Required cylinder(s) quantities and test age as follows:
      a. 1 at 3 days.
      b. 1 at 7 days
      c. 1 at 28 days
      d. 1 reserved cylinder to be tested under the direction of the Engineer, if required. In the event the 28-day required strength is achieved, the cylinder may be discarded.

B. Soils Testing
   1. Testing for soils shall comply with the requirements of the Geotechnical Report(s) and the Civil Engineers Specification whichever is more stringent in all aspects of the recommendations including but not limited to compaction, frequency and depth of lift.

C. Other Testing
   1. Visual inspection for 100% of field welding for metal joists, metal decking and miscellaneous metals.
   2. Inspection / Testing of Field Bolts:
      a. Use load indicating bolts of washers, or;
      b. Test all bolts in 100% of the connections with a calibrated torque wrench, or;
      c. Observe tightening of 25% of all bolts if tightened by turn of the nut method.

D. Project Engineer shall visit the project site on the schedule outlined on the structural drawings with notification from the General Contractor.

PART 3 - EXECUTION

3.1 COOPERATION WITH TESTING LABORATORY

A. Representatives of the testing laboratory shall have access to the Work at all times and at all locations where the Work is in progress. Provide facilities for such access to enable the laboratory to perform its functions properly.

3.2 TAKING SPECIMENS

A. All specimens and samples for testing, unless otherwise provided in the Contract Documents, shall be taken by the testing personnel. All sampling equipment and personnel will be provided by the testing laboratory. All deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.3 SCHEDULES FOR TESTING

A. Establishing Schedule:
   1. By advance discussion with the testing laboratory approved by the Architect, determine the time required for the laboratory to perform its tests and to issue each of its findings.
   2. Provide all required time with the construction schedule.

B. Revising Schedule:
   1. When changes of construction schedule are necessary during construction, coordinate all such changes with the testing laboratory, Architect and engineer as required.

C. Adherence to Schedule:
   1. When the testing laboratory is ready to test according to the established schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra charges for testing attributable to the delay, including but not limited to waiting charges, shall be paid by the Contractor and shall not be borne by the Owner.

3.4 REPORTING

A. Furnish copies of the tests results directly to the Owner, Civil Engineer, Structural Engineer and the Architect promptly upon completion of the test but not later than three (3) days after the test.

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes construction facilities and temporary controls required for the Work.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Except that equipment furnished by subcontractors shall comply with requirements of pertinent safety regulations, such equipment normally furnished by the individual trades in execution of their own portions of the Work are not part of this Section.
   3. Permanent installation and hookup of the various utility lines are described in other Sections.

1.2 REQUIREMENTS

A. Provide construction facilities and temporary controls needed for the Work including, but not necessarily limited to:
   1. Temporary utilities such as heat, water, electricity, telephone, and facsimile.
   2. Field office for the Contractor's personnel.
   3. Sanitary facilities.
   4. Enclosures such as tarpaulins, barricades, and canopies.
   5. Temporary fencing.
   6. Project sign modifications.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

PART 2 - PRODUCTS

2.1 UTILITIES

A. Water:
   1. Provide necessary temporary piping and water supply, and upon completion of the Work, remove such temporary facilities.

B. Electricity:
   1. Provide necessary temporary wiring and, upon completion of the Work, remove such temporary facility.

2. Provide area distribution boxes so located that the individual trades may furnish and use 100 ft. maximum length extension cords to obtain power and lighting at points where needed for work, inspection, and safety.

C. Heating:
   1. Provide and maintain heat necessary for proper conduct of operations needed in the Work.

D. Telephone:
   1. Make necessary arrangements and pay costs for installation and operation of telephone service to the Contractor's office at the site.
   2. Make the telephone available to the Architect for use in connection with the Work.

2.2 FIELD OFFICES AND SHEDS

A. Contractor's Facilities:
   1. Provide a field office trailer adequate in size and accommodation for Contractor's offices, supply, and storage.
   2. Within the Contractor's facilities, provide enclosed office space with a toilet and sink that is adequate for holding project meetings. Furnish with table, chairs, and utilities adequate to seat 15 persons.
   3. The Contractor shall provide a full-time site representative with qualifications acceptable to the Owner and Architect. The Contractor's representative shall be on-site at all times when work is in progress, and shall not be removed from the project without written permission of the Owner and Architect.

B. Sanitary Facilities:
   1. Provide temporary sanitary facilities in the quantity required for use by all personnel.
   2. Maintain in a sanitary condition at all times.

2.3 ENCLOSURES

A. Provide and maintain for the duration of construction all scaffolds, tarpaulins, canopies, warning signs, steps, platforms, and other temporary construction necessary for proper completion of the Work in compliance with pertinent safety and other regulations.

2.4 TEMPORARY FENCING

A. Provide and maintain for the duration of construction a temporary fence of design and type needed to prevent entry onto the Work by the public.

2.5 PROJECT SIGNS

A. Prepare project identification and other temporary signs as may be required. Engage the services of an experienced sign painter to apply graphics in neat professional manner. Provide a 4' x 8' sign, and ADD the General Contractor's name in a layout approved by the Architect and as illustrated on the drawings.

B. Upon completion of the Work, demount the job sign and return to the Architect's office unless otherwise directed.

C. Except as otherwise specifically approved by the Architect, do not permit other signs or advertising on the job site including job trailer advertising.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL

A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the Work.

B. Remove such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the Architect.

END OF SECTION

SECTION 01540
SECURITY

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Provide a project security program to:
   1. Protect work, stored products and construction equipment from theft and vandalism.
   2. Protect premises from entry by unauthorized persons.

B. Protect Owner's operations at site from theft, vandalism or damage from Contractor's work or employees.

C. RELATED WORK

   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 MAINTENANCE OF SECURITY

A. Initiate security when required to prevent theft of stored materials.

B. Maintain security program throughout construction period, until Owner occupancy or Owner acceptance precludes the need for Contractor security.

1.3 PERSONNEL

A. Identification:
   1. Provide identification to each person authorized to enter the Project premises, showing:
      a. Name of the individual and assigned number.
      b. Name of employer.
   2. Maintain a current list of accredited persons, submit a copy of the list to Owner on request.
   3. Require that identification be displayed by all persons entering, and on the premises.

B. Exclude from site personnel not properly identified.

1.4 ENTRANCE CONTROL

A. Provide control of all persons and vehicles entering and leaving Project site.
   1. Require display of proper identification by each person.

2. Allow no visitors except with issuance of temporary identification.
3. Maintain log of visitors.

B. Contractor shall control deliveries and vehicles related to his own operations.

END OF SECTION

SECTION 01545
CONTRACTOR'S USE OF THE PREMISES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section applies to all situations in which the Contractor or his representatives including, but not necessarily limited to, suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Maintain an accurate record of the names and identification of all persons entering upon the Owner's property in connection with the Work of this Contract, including times of entering and times of leaving, and submit a copy of the record to the Architect monthly utilizing the approved form.

1.3 QUALITY ASSURANCE

A. Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.

B. Require that all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.

1.4 ACCESS AND PARKING

A. Restrict the access of all persons entering upon the Owner's property in connection with the Work to the Access Route and to the actual site of the Work.

B. Contractor's vehicles:
   1. Require Contractor's vehicles, vehicles belonging to employees of the Contractor, and all other vehicles entering upon the Owner's property in performance of the Work of the Contract, to use only the areas immediately adjacent to the construction site.
   2. Coordinate acceptable parking and staging areas within the limits of construction identified and repair damaged existing areas to like new condition.
   3. Instruct all subcontractors to park only in the areas approved, and to minimize disruption of on-site traffic.
      A. Repair or replace damaged materials or surfaces resulting from any of the following:
         1. Use of temporary surfaces over finished surface.
         2. Use of final surfaces for construction purposes.

B. Leave all existing or new permanent roads, walks and parking areas in first class condition meeting Specifications upon completion of construction operations.

END OF SECTION

SECTION 01620
STORAGE AND PROTECTION

PART 1 – GENERAL

1.1 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Architect, determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
   1. Maintain packaged materials with seals unbroken and labels intact until time of use.
   2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements at no additional cost to the Owner.

B. The Architect and/or Contractor may reject as noncomplying such material and products that do not bear identification satisfactory to the Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

B. Provide protection for finished floor surfaces (including sidewalks and drives) in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Architect and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will NOT be considered by the Architect to justify an extension in the Contract Time of Completion.

END OF SECTION

SECTION 01630
PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes product options available to bidders and the Contractor, plus procedures for securing approval of proposed substitutions prior to receipt of bids. The submission of substitutions must be accomplished a **minimum of seven (7) days prior** to the receipt of bids. Substitutions requested after receipt of bids shall be returned to the Contractor without action by the Architect.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Make submittals in accordance with pertinent provisions of Section 01340.

1.2 PRODUCT OPTIONS

A. The contract is based on standards of quality established in the Contract Documents.
   1. In agreeing to the terms and conditions of the Contract, the Contractor has accepted a responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.
   2. Neither the Owner nor the Architect has agreed to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

B. Materials and/or methods specified by name:
   1. Where materials and/or methods are specified by naming one single manufacturer and/or model number, without stating that equal products will be considered, only the material and/or method named is approved for incorporation into the Work.
   2. PRODUCT LIST:
      a. Within 30 days after the contract date, submit to the Architect a complete list of major products to be used, with the name of the manufacturer and the installing sub-contractor.
      b. Verify product availability for the scheduled delivery date.
   3. Should the Contractor demonstrate to the approval of the Architect that a specified material or method was ordered in a timely manner and will not be available in time for incorporation into this Work, the Contractor shall submit to the Architect such data on proposed substitute materials and/or methods as are needed to help the Architect determine suitability of the proposed substitution.

C. Where materials and/or methods are specified by name and/or model number, followed by the words “or an equal approved in advance by the Architect”:

1. The material and/or method specified by name establishes the required standard of quality.
2. Materials and/or methods proposed by the Contractor to be used in lieu of materials and/or methods so specified by name shall in all ways equal or exceed the qualities of the named materials and/or methods.

D. The following products do not require further approval except for interface within the Work:
1. Products specified by reference to standard specifications such as ASTM and similar standards.
2. Products specified by manufacturer's name and catalog model number.

E. Where the phrase "or equal", or "or equal as approved by the Architect", occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved **in advance** for this Work by the Architect.

F. The decision of the Architect shall be final.

1.3 REIMBURSEMENT OF ARCHITECT'S COSTS

A. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by the Architect and the Architect's consultants in evaluating each such proposed substitution.

B. Whether or not the Architect approves a proposed substitution, the Contractor promptly upon receipt of the Architect's billing shall reimburse the Architect at the rate of three (3) times the direct cost to the Architect and the Architect's consultants for all time spent by them in evaluating the proposed substitution.

1.4 DELAYS

A. Delays in construction arising by virtue of the nonavailability of a specified material and/or method will not be considered by the Architect as justifying an extension of the agreed Time of Completion.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes an orderly and efficient transfer of the completed Work to the Owner.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Activities relative to Substantial Completion and Contract closeout are described in the General Conditions.

1.2 QUALITY ASSURANCE

A. Prior to requesting review by the Architect, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.

1.3 PROCEDURES

A. Substantial Completion:
   1. Prepare and submit the list required by the first sentence of Paragraph 9.8.2 of the General Conditions.
   2. Within a reasonable time after receipt of the list, the Architect will inspect to determine status of completion.
   3. Should the Architect determine that the Work is not substantially complete:
      a) The Architect promptly will so notify the Contractor, in writing, giving the reasons therefore.
      b) Remedy the deficiencies and notify the Architect when ready for review.
      c) The Architect will review the Work.
   4. When the Architect concurs that the Work is substantially complete:
      a) The Architect will prepare a “Certificate of Substantial Completion”, accompanied by the Contractor’s list of items to be completed or corrected, as verified by the Architect.
      b) The Architect will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

B. Final Completion:
   1. Prepare and submit the notice required by the first sentence of Paragraph 9.10.1 of the General Conditions.
   2. Verify that the Work is complete including, but not necessarily limited to, the items mentioned in Paragraph 9.10.2 of the General Conditions.

   3. Certify that -

a) Contract Documents have been reviewed.
b) Work has been inspected for compliance with the Contract Documents.
c) Work has been completed in accordance with the Contract Documents.
d) Equipment and systems have been tested as required and are operational.
e) Work is completed and ready for final inspection.

4. The Architect will make an inspection to verify status of completion.
5. Should the Architect determine that the Work is incomplete or defective work -
   a) The Architect promptly will so notify the Contractor, in writing, listing the incomplete or defective work.
   b) Remedy the deficiencies promptly, and notify the Architect when ready for reinspection.
6. When the Architect determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make closeout submittals.

C. Closeout submittals include, but are not necessarily limited to:
1. Project Record Documents described in Section 01720.
2. Operation and maintenance data for items so listed in pertinent other Sections of these Specifications, and for other items when so directed by the Architect.
3. Warranties and bonds.
4. Keys and keying schedule.
5. Spare parts and materials extra stock.
6. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to -
   a) Certificates of Inspection
   b) Certificates of Occupancy
7. Certificates of Insurance for products and completed operations.
8. Evidence of payment and release of liens.
9. List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.
10. Certificates of Occupancy and Final Inspection by the local governing authorities.

D. Final adjustment of accounts:
1. Submit a final statement of accounting to the Architect, showing all adjustments to the Contract Sum.
2. If so required, the Architect will prepare a final Change Order showing adjustments to the Contract Sum which were not made by Change Orders.

1.4 INSPECTION

A. Instruct the Owner’s personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work.

END OF SECTION

SECTION 01710
CLEANING

PART 1 – GENERAL

1.1 SUMMARY

A. Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. In addition to standards described in this Section, comply with requirements for cleaning as described in pertinent other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Conduct daily inspection, and more often if necessary, to verify that requirements for cleanliness are being met.

B. In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

A. General:
   1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
   2. Do not allow accumulation of scrap, debris, waste material, and other items not required for construction of this Work.

3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:
1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph 3.1-A-1 above.
3. Maintain the site in a neat and orderly condition at all times.

C. Structures:
1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep interior spaces clean.
   a) "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a hand-held broom.
3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the necessary cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials are installed.
   a) "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material.

3.2 FINAL CLEANING

A. "Clean", for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

B. Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.1 above.

C. Site:
1. Unless otherwise specifically directed by the Architect, broom clean paved areas on the site and public paved areas adjacent to the site.
2. Completely remove resultant debris.

D. Structures:
1. Exterior -

a) Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
b) Remove all traces of splashed materials from adjacent surfaces.
c) If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
d) In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Interior -
a) Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
b) Remove all traces of splashed material from adjacent surfaces.
c) Remove paint droppings, spots, stains, and dirt from finished surfaces.

3. Glass -
a) Clean inside and outside.

4. Polished Surfaces -
a) To surfaces requiring routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.

E. Schedule final cleaning as approved by the Architect to enable the Owner to accept a completely clean Work.

3.3 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning shall be as determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION

SECTION 01720
PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below and, upon completion of the Work, transfer the recorded changes to a set of Record Documents, as described in Article 3.2 below.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. The Architect's approval of the current status of Project Record Documents may be a prerequisite to the Architect's approval of requests for progress payment and request for final payment under the Contract.

C. Prior to submitting each request for progress payment, secure the Architect's approval of the current status of the Project Record Documents.

D. Prior to submitting request for final payment, submit the final Project Record Documents to the Architect and secure his approval.

1.3 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect.

B. Accuracy of Records:
   1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
   2. Accuracy of records shall be such that future searches for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

C. Make entries within 24 hours after receipt of information that the change has occurred.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.

B. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's approval.
   1. Such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials.
   2. In such case, provide replacements to the standards originally required by the Contract Documents.

PART 2 – PRODUCTS

2.1 RECORD DOCUMENTS

A. Job Set:
   1. Promptly following receipt of the Owner's Notice to Proceed, secure at the cost of reproduction, charged to the Contractor, two (2) complete sets of all Documents comprising the Contract.

B. Final Record Documents:
   1. Preserve one (1) complete set of all Documents for the Final Record Documents.

PART 3 – EXECUTION

3.1 MAINTENANCE OF JOB SET

A. Immediately upon receipt of the job set described in Paragraph 2.1-A above, identify each of the Documents with the title, "RECORD DOCUMENTS – JOB SET".

B. Preservation:
   1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect.
   2. Do not use the job set for any purpose except entry of new data and for review by the Architect, until start of transfer of data to final Project Record Documents.
   3. Maintain the job set at the site of Work as that site is designated by the Architect.

C. Making Entries on Drawings:
   1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
   2. Date all entries.
   3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
   4. In the event of overlapping changes, use different colors for the overlapping changes.

D. Make entries in the pertinent other documents as approved by the Architect.

E. Conversion of Schematic Layouts:
   1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, is shown schematically and is not intended to portray precise physical layout.
      a) Final physical arrangement is determined by the Contractor, subject to the Architect's approval.
      b) However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.
   2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in subparagraph 3.1-E-1 above.
      a) Clearly identify the item by accurate note such as "cast iron drain", "galv. water", and the like.
      b) Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum", "exposed", and the like).
      c) Make all identification so descriptive that it may be related reliably to the Specifications.
   3. The Architect may waive the requirements for conversion of schematic layout where, in the Architect's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Architect.

3.2 FINAL PROJECT RECORD DOCUMENTS

A. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

B. Approval of recorded data prior to transfer:
   1. Following receipt of the documents described in Paragraph 2.1-B above, and prior to start of transfer of recorded data thereto, secure the Architect's approval of all recorded data.
   2. Make required revisions.

C. Transfer of data to Drawings:
   1. Carefully transfer change data shown on the job set of Record Drawings to the corresponding documents, coordinating the changes as required.
   2. Clearly indicate at each affected detail and other Drawings a full description of changes made during construction, and the actual location of items described in subparagraph 3.1-E-1 above.
   3. Call attention to each entry by drawing a "cloud" around the area or areas affected.
   4. Make changes neatly, consistently, and with the proper media to assure longevity and clear reproduction.
   5. Changes to the drawings shall be made by a competent draftsperson, to the scale matching the drawing revised.

D. Transfer of Data to other Documents:
   1. If the Documents other than Drawings have been kept clean during progress of the Work, and if entries thereon have been orderly to the approval of the Architect, the job set of these Documents other than Drawings will be accepted as final Record Documents.
   2. If any such Document is not so approved by the Architect, secure a new copy of that Document from the Architect at the Architect's usual charge for reproduction and handling, and carefully transfer the change data to the new copy to the approval of the Architect.

E. Review and Submittal:
   1. Submit the completed set of Project Record Documents to the Architect as described in Paragraph 1.2-D above.
   2. Participate in review meetings as required.
   3. Make required changes and promptly deliver three (3) complete full-sized digital blackline sets, plus three (3) CD-Rom disks with pdf images of all drawings and data of the final Project Record Documents and the drawings to the Architect.
   4. The Architect shall distribute one (1) copy each to the project site and the Owners' Representative and shall retain one (1) copy as project record.

3.3 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

END OF SECTION

SECTION 01730
OPERATION AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 SUMMARY

A. To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding products incorporated into the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Required contents of submittals also may be amplified in pertinent other Sections of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Submit one copy of a preliminary draft of the proposed Manual or Manuals to the Architect for review and comments.

C. Unless otherwise directed in other Sections, or in writing by the Architect, submit three copies of the final Manual to the Architect a minimum of forty-eight hours prior to indoctrination of operation and maintenance personnel.

1.3 QUALITY ASSURANCE

A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

PART 2 – PRODUCTS

2.1 INSTRUCTION MANUALS

A. Where instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provisions of this Section.

B. Format:
   1. Size: 8-1/2” x 11”
   2. Paper: White bond, at least 20 lb. weight

3. Text: Neatly type written or printed
4. Drawings: 11" in height preferable; bind in with text; fold out acceptable; larger drawings acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
5. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
6. Binding: Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the Manual; 3-ring binders will be acceptable; all binding is subject to the Architect's approval.
7. Measurements: Provide all measurements in U.S. standard units such as feet-and-Inches, lbs., and cfm.

C. Provide front and back covers for each Manual, using durable material approved by the Architect, and clearly identified on or through the cover and on the spine with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS
( )
(Name and Address of Work)
( )
(Name of Contractor)
( )
(General Subject of This Manual)
( )
(Space for Signature of the)
(Architect, and Approval Date)

D. Contents: Include at least the following:
1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.
2. Complete instructions regarding operation and maintenance of all equipment involved including lubrication, disassembly, and reassembly.
3. Complete nomenclature of all parts of the equipment.
4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
5. Copy of all guarantees and warranties issued.
6. Manufacturer's bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
7. Such other data as required in pertinent other Sections of these Specifications.

PART 3 – EXECUTION

3.1 INSTRUCTION MANUALS

A. Preliminary:
   1. Prepare a preliminary draft of each proposed Manual.
   2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.
   3. Secure the Architect's approval prior to proceeding.

B. Final:
   1. Complete the Manuals in strict accordance with the approved preliminary drafts and the Architect's review comments.
   2. Deliver three (3) completed sets plus three (3) CD-Rom disks with pdf images of all drawings and all final data to the Architect. The Architect shall distribute one (1) copy each to the project site and the Owners' Representative and shall retain one (1) copy as project record.

C. Revisions:
   1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Architect.
   2. If the Contractor is required by the Architect to revise previously approved Manuals, compensation will be made as provided for under "Changes" in the General Conditions.
   3. Deliver three (3) completed sets plus three (3) revised CD-Rom disks with pdf images of all drawings and all final data to the Architect.

END OF SECTION

SECTION 01740
WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to Architect for review and transmittal to Owner.

1.2 RELATED SECTIONS

A. Instructions to Bidders - Bid or Proposal Bonds.

B. Conditions of the Contract - Labor and Material Payment Bond.

C. Supplementary Conditions - Maintenance Bonds.

D. Conditions of the Contract - General Warranty of Construction.

E. Section 01700 - Contract Close-Out.

F. Section 01730 - Operating and Maintenance Data.

G. Each respective Section of Specifications: Warranties and Bonds Required for Specific Products.

H. The respective Section of Specifications which specifies the product: Provisions of Warranties & Bonds, Duration.

1.3 SUBMITTAL REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of respective manufacturers, suppliers and subcontractors in accordance with Section 00710 - General Conditions and Supplementary Conditions.

B. Number of original signed copies required: Two (2) each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item:
   1. Product or work item.

2. Firm, with name of principal, address and telephone number.
3. Scope.
4. Date of beginning of warranty, bond or service and maintenance contract. In no case shall the date begin prior to acceptance by Architect of that portion of the work or the date of Substantial Completion, whichever is the latter.
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner's personnel:
    a. Proper procedure in case of failure.
    b. Instances which might affect the validity of warranty or bond.
    c. Contractor, name of responsible principal, address and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:
1. Size: 8-1/2" x 11" punch sheets for standard 3-ring binder:
    a. Fold larger sheets to fit into binders.
2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
    a. Title of Project.
    b. Location of Project.
    c. Name of Contractor.

C. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers, all of same color.

1.5 TIME OF SUBMITTALS

A. For equipment of component parts of equipment put into service during progress of construction:
1. Submit documents within ten (10) days after the Date of Substantial Completion, prior to final request for payment.

B. For items of work where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in respective Sections of Specifications.

B. Submit additional manufacturer's standard warranties where available at no additional cost, but not specifically indicated in respective Specification Sections.

1 END OF SECTION

SECTION 02010
SUBSURFACE INVESTIGATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section describes soils investigation at the site, and use of data resulting from that investigation.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. As established in the General Conditions of the Contract, the Contractor is solely responsible for means and methods of construction and for the sequences and procedures to be used.

1.2 SOILS INVESTIGATION REPORT

A. General:
   1. Subsurface and physical conditions reports have been prepared for the site of this Work by several soil investigation engineers selected by the Owner.
   2. The reports have been identified under the site-civil construction documents and have been made included in the bid document package. Additional copies may be requested from the Owner, and the cost of reproduction, postage and handling may be requested by the Owner.

B. Use of Data:
   1. This report was obtained only for the Design Professionals use in design and is not a part of the Contract Documents.
   2. The report is available for bidders' information, but is not a warranty of subsurface conditions.
   3. Bidders should visit the site and acquaint themselves with existing conditions.
   4. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but such investigations may be performed only under time schedules and arrangements approved in advance by the Owner.

1.3 QUALITY ASSURANCE

A. A professional geotechnical engineer, licensed and registered in the state of Florida, **shall be retained by the Contractor** to observe performance of work in connection with building construction, site-civil excavating, trenching, filling, backfilling, grading, etc, and to perform required testing as outlined within the site-civil and architect's construction documents and technical specifications .

B. Readjust work performed that does not meet technical or design requirements, but make no deviation from the Contract Documents without specific and written review of the Civil Engineer.

END OF SECTION

SECTION 02281
TERMITE CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work included: Provide soil poisoning to control subterranean termites as specified herein and needed for a complete and proper treatment.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Qualifications of Subcontractors:
   1. Properly licensed to provide such services by governmental agencies having jurisdiction.
   2. Not less than five (5) years successful experience in soil treatment for subterranean termites.

1.3 WARRANTY

A. Upon completion of the Work, and as a condition of its acceptance, deliver to the Architect two (2) copies of a Warranty signed by an authorized representative of the installing subcontractor, and co-signed by the Contractor, agreeing:
   1. To make an inspection of the Work in one year following Date of Substantial Completion for the purpose of detecting termite infestation;
   2. If termite infestation is found during first year period, to retreat in accordance with prevailing practices of the trade and within ten (10) calendar days after such infestation is discovered at no cost to the Owner;
   3. To repair damage to the Work caused by subterranean termites during that first year period.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide working solutions of toxicants for proper soil poisoning treatment approved and recommended by all governmental and safety regulations pertaining to the Work of this Section.

B. If combination of toxicants are approved by governmental agencies having jurisdiction, provide toxicants having such approval and in the maximum strength so approved, at no cost to the Owner.

PART 3 – EXECUTION

3.1 APPLICATION

A. Begin soil poisoning only after all preparation for slab placement is complete.

B. Apply toxicant at slabs on grade, utility entrances, foundation walls, cross walls, grade beams, below expansion joints, construction joints, all areas where slabs will be penetrated by construction features and along exterior facings or veneers extended below grade as recommended by the manufacturer and governmental agencies.

C. If soil is disturbed after treatment or heavy rain occurs, retreat disturbed areas.

END OF SECTION

SECTION 03100
CONCRETE FORMWORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 03200 – Concrete Reinforcement
   3. Section 03300 – Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Design of formwork is the Contractor's responsibility and shall be verified by the submission of design drawings and the construction of sample wall(s).

C. Standards:
   1. In addition to complying with pertinent regulation of governmental agencies having jurisdiction, comply with pertinent provisions of ACI 347.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01620.

1.4 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

A. Use only forms that are in good condition. Remove from the job site any form material that is not suitable for neat and true formwork and/or is not considered acceptable by the Architect.

Materials may be reused during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of required quality.

B. For footings and foundations, use 2" nominal thick construction lumber secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.

C. For studs, wales, and supports, use Construction grade or better lumber, dimensions as required to support the loads but not less than 2" x 4".

D. Beam, Tie Beam, and Pilaster Forms:
   1. Use ¾" minimum thickness Douglas Fir plywood, grade CDX.
   2. Seal edges and coat both faces of uncoated surfaces with colorless coating which will not affect application of applied finishes.

E. Column Forms, if required:
   1. For square or rectangular columns, use ¾" minimum thickness Douglas Fir plywood, grade CDX, or use metal forms.
   2. For round columns, use patented paper tube forms approved by the Architect. Use seamless forms where the finish is to be an applied coating.
   3. Construct column forms with tight joints and securely clamped together with steel clamps.
   4. Seal edges and coat both faces of uncoated surfaces with colorless coating which will not affect application of applied finishes.

F. Wall Forms, if required:
   1. Forms for exposed Architectural concrete shall be new and unused.
   2. Forms shall be free of damage and defects that could cause imperfection in the finished wall surface
   3. Form joint spacing shall be equal and symmetrical in and orderly manner as approved in advance by the Architect.
   4. Construct wall forms with tight joints and securely clamped together with steel clamps.
   5. Seal edges and coat both faces of uncoated surfaces with colorless coating which will not affect application of applied finishes.

2.2 FORM TIES

A. Hold inner and outer forms for vertical concrete together with combination steel ties, spreader, and clamps approved by the Architect.

2.3 DESIGN OF FORMWORK

A. General:
   1. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.
   2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose

3. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.

2.4 EARTH FORMS

A. Side forms shall be utilized and earth forming shall not be allowed.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FORM COATINGS

A. Coat form contact surfaces with form coating compound before reinforcement is placed.
   1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces which will bond to fresh concrete.
   2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

3.3 REMOVAL OF FORMS

A. General:
   1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
   2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.

B. Finished Surfaces:
   1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.
   2. Release sleeve nuts or clamps, and pull the form ties neatly.
   3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
   4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use cement grout, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.
   5. Architectural concrete shall be smooth and free of imperfections. Correction of defects shall be limited and removal of imperfect walls shall be as directed by the Architect.

END OF SECTION

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included:
   1. Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 03100 – Concrete Formwork
   3. Section 03300 – Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with pertinent provisions of the following, except as may be modified herein:
   1. ACI 318, latest edition.
   2. CRSI “Manual of Standard Practice”, latest edition.
   3. ACI 301, latest edition.

C. All reinforcing shall be inspected and approved by the Architect prior to placement of concrete. Failure to obtain the Architect’s approval may result in removal of the Work or testing of the Work at the Contractor’s expense.

1.3 SUBMITTALS

A. Shop Drawings required.

1.4 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer’s specifications, the Engineer’s specification shall supersede the Architect’s requirements, unless directed otherwise by the Architect.

PART 2 – PRODUCTS

2.1 REINFORCEMENT MATERIALS AND ACCESSORIES

A. Bars:
   1. Provide deformed billet steel bars complying with ASTM A615, latest edition.
   2. All reinforcing shall be Grade 60

B. Steel Wire:
   1. Comply with ASTM A82, latest edition.
   2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gauge minimum.

C. Welded Wire Fabric:
   1. Provide welded steel, complying with ASTM A185, latest edition.

D. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:
   1. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.
   2. Do not use wood, brick, or other non-complying material, except concrete brick or pavers may be used in spread footings.
   3. Where legs of supports are in contact with forms, provide supports with either hot-dipped galvanized or plastic protected legs.
   4. For supports on grade use hot-dipped galvanized or plastic protected plates.

2.2 FABRICATION

A. General:
   1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.
   2. In case of fabricating errors, do not straighten or rebend reinforcement in a manner that will weaken or injure the material.
   3. Reinforcement with any of the following defects will not be acceptable:
      a) Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances.
      b) Bends or kinks not shown on the Drawings.
      c) Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.

2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
3. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations.
4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
5. Place reinforcement to obtain minimum coverage for concrete protection.
6. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.
7. Set wire ties so twisted ends are directed away from exposed concrete surfaces.

B. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least one full mesh plus two (2”) inches. Use of flat manufactured sheets is recommended.

3.3 SPLICES

A. Lap Splices:
1. Tie securely with the specified wire to prevent displacement of splices during placement of concrete.

B. Do not splice bars except at locations shown on the Drawings, except as otherwise specifically approved by the Architect.

C. Do not place reinforcing bars more than 2” beyond last leg of any continuous bar support.

D. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Provide cast-in-place concrete, including formwork and reinforcement, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 01410 – Testing Laboratory Services
   3. Section 03345 – Concrete Finishing.
   4. Section 03370 – Concrete Sealing and Curing.
   5. Section 07190 – Subgrade Vapor Barrier

1.2 SUBMITTALS

A. Secure concrete mix designs from the testing laboratory in accordance with provisions of Section 01410, and submit to the Architect for review and approval.

B. Distribute approved mix designs to testing laboratory, batch plant, job site, and governmental agencies having jurisdiction.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with "Specifications for Structural Concrete for Buildings," ACI 301, except as may be modified herein.

C. Provide access for, and cooperate with, the inspector and testing laboratory described in Section 01410 of these Specifications.

D. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect/Engineer and all governmental agencies having jurisdiction, and until copies of the approved mix designs are at the job site and the batch plant.

E. Comply with Florida Building Code, Edition adopted by Governing Authority at time of start of work.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 - PRODUCTS

2.1 FORMS

A. Design, erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.

B. Construct forms to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.

2.2 MOISTURE BARRIER

A. Where so indicated on the Drawings, provide a moisture barrier complying with:
   1. The requirements of Section 07190.

2.3 REINFORCEMENT

A. Comply with the following as minimums:
   1. Bars - ASTM A615, grade 60 unless otherwise shown on the Drawings, using deformed bars for number 3 and larger;
   2. Welded wire fabric - ASTM A185;
   3. Bending - ACI 318.

B. Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in the CRSI "Manual of Standard Practices."

C. Do not use reinforcement having any of the following defects:
   1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
   2. Bends or kinks not indicated on the Drawings or required for this Work;
   3. Bars with cross-section reduced due to excessive rust or other causes.

2.4 CONCRETE

A. Comply with the following as minimums:
   1. Portland cement - ASTM C150, type I or II, low alkali.
   2. Aggregate, general -
      a) ASTM C33, uniformly graded and clean;
      b) Do not use aggregate known to cause excessive shrinkage.
   3. Aggregate, coarse - Crushed rock or washed gravel with minimum size between 3/4" and 1-1/2", and with a maximum size number 4. Verify size number with the final mix designs.
   4. Aggregate, fine – Manufactured or natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh

screen.

5. Water - Clean and potable.

B. Provide concrete with the compressive strengths shown on the Drawings. When such strengths are not shown on the Drawings, provide the following as minimums:
   1. Concrete footings ……...……...3000 psi
   2. Concrete walls.....…….....4000 psi
   3. Concrete beams and columns…….4000 psi
   4. Concrete walks and slabs on grade.....……3000 psi
   5. Masonry grout, pilasters and tie beams (pump grade)… 2000 psi
   6. Structural topping …….4000 psi

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.
   1. Air Entraining Admixture - ASTM C 260-77.
   2. Water Reducing and Retarding Admixture: - ASTM C 494-79, Type D. Admixture shall not contain calcium chloride.
   3. The epoxy bonding agent shall be of the type manufactured by W. R. Grace, Sika Products, or approved equal.
   4. Expansion joint material shall be synthetic foam consisting of closed cell isomeric polymers in accordance with ASTM D-545.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 REINFORCING

A. Comply with the following, as well as the specified standards, for details and methods of reinforcing placement and supports.
   1. Clean reinforcement and remove loose dust and mill scale, earth, and other materials which reduce bond or destroy bond with concrete.
   2. Position, support, and secure reinforcement against displacement by forms, construction, and the concrete placement operations.
   3. Place reinforcement to obtain the required cover for concrete protection.
   4. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces one full mesh plus 2” minimum.
   5. Unless otherwise shown on the Drawings, or required by governmental agencies having jurisdiction, lap bars 24 diameters minimum.

3.3 EMBEDDED ITEMS

A. Do not embed piping, other than electrical conduit, in structural concrete, except where specifically indicated on the Drawings.
   1. Locate conduit to maintain maximum strength of the structure.
   2. Increase the thickness of the concrete if the outside diameter of the conduit exceeds 30% of the thickness of the concrete.

B. Set bolts, inserts, and other required items in the concrete, accurately secured so they will not be displaced, and in the precise locations needed.

3.4 MIXING CONCRETE

A. Transit mix the concrete in accordance with provisions of ASTM C94.

B. Mixing water:
   1. At the batch plant, withhold 2-1/2 gal of water per cu yd of concrete.
   2. Upon arrival at the job site, add all or part of the withheld water (as required for proper slump) before the concrete is discharged from the mixer.
   3. Mix not less than five minutes after the withheld water has been added, and not less than one minute of that time immediately prior to discharge of the batch.
   4. Unless otherwise directed, provide 15 minutes total mixing time per batch after first addition of water.

C. Do not use concrete that has stood for over 30 minutes after leaving the mixer, or concrete that is not placed within 90 minutes after water is first introduced into the mix.

D. Air entraining admixture shall be charged into the mixture as a solution and shall be measured by means of an approved mechanical dispensing device. The liquid shall be considered a part of the mixing water.

E. Water reducing and retarding admixture shall be added and measured as recommended by the manufacturer. The addition of the admixture shall be separate from the air-entraining admixture. The addition of the admixture shall be completed within one minute after addition of water to the cement has been completed, or prior to the beginning of the last three-quarters of the required mixing, whichever occurs first. Admixtures shall be stored, handled and batched in accordance with the recommendations of ACI 68-56.

F. In addition to the information required by ASTM C 94-78a, delivery tickets shall indicate the cement content and the water/cement ratio.

G. No modifications to the mix shall be made in the plant or on the job which will decrease the cement content or increase the water-cement ratio beyond that specified. No modifications of any kind shall be made except by a qualified and responsible representative of the concrete producer. Such modifications shall be clearly indicated on delivery ticket and correspondence to testing lab.

3.5 PREPARATION

A. No concrete shall be placed until the approval of the Architect/Engineer has been received.

Approval will not be granted until forms are thoroughly clean and reinforcing, and all other items required to be set in concrete have been placed and thoroughly secured.

3.6 CONVEYING

A. Handle concrete from the truck to the place of final deposit as rapidly as practicable by methods that will prevent segregation or loss of ingredients to maintain the quality of the concrete. Place no concrete more than 90 minutes after mixing has begun for that particular batch.
   1. The temperature of the concrete upon delivery from the truck shall not exceed 90 degrees F.

B. Utilize buckets and hoppers with discharge gates with a clear opening equal to no less than one-third of the maximum interior horizontal area or five times the maximum aggregate size being used. Side slopes shall be no less than 60 degrees. Controls on gates shall permit opening and closing during the discharge cycle.

C. Use hoppers and elephant trunks to prevent the free fall of concrete for more than 4 feet.

D. Utilize metal or metal lined chutes with slopes not exceeding one vertical to two horizontal and no less than one vertical to three horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used only if they discharge into a hopper before distribution.

E. Pumping equipment and procedures, if used, shall conform to the recommendations contained in the report of ACI committee 304 on "Placing Concrete by Pumping Methods"- 1968. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1-1/2 inches.

F. Clean conveying equipment at the end of each concrete operation.

3.7 PLACING

A. Preparation:
   1. Remove foreign matter accumulated in the forms.
   2. Rigidly close openings left in the formwork.
   3. Wet wood forms sufficiently to tighten up cracks; wet other material sufficiently to maintain workability of the concrete.
   4. Use only clean tools.
   5. Deposit concrete continuously, or in layers of such thickness (not exceeding 2 feet in depth) that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness.

B. At least two hours shall elapse after depositing concrete in columns or walls before depositing in beams, girders or slabs supported thereon.

C. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to any procedure that will cause segregation.

D. Place all concrete in the dry and at such a rate that concrete which is being integrated with fresh concrete is still plastic.

E. Except as otherwise indicated on the Drawings, provide horizontal construction joints at top of foundation members and slabs on grade and at the soffit of supported slabs and beams. Other horizontal and vertical construction joints shall be located as indicated on the Drawings. Joints will not be permitted except in the locations shown unless approved be the Architect.

F. Before depositing new concrete on or against concrete that has set, the surfaces of the set concrete shall be thoroughly cleaned so as to expose the coarse aggregate and be free of laitance, coatings, foreign matter and loose particles. Forms shall be retightened. The hardened concrete of joints shall be dampened, but not saturated, and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least 1/2 inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.

G. In addition to steel reinforcement, pipes, inserts and other metal objects as shown, specified or ordered shall be built into, set in or attached to the concrete. Take all necessary precautions to prevent these objects from being displaced, broken or deformed. Before concrete is placed, ensure all embedded parts are firmly and securely fastened in place as indicated. They shall be thoroughly clean and free from paint or other coating, rust, scale, oil or any foreign matter. Do not embed wood in concrete. Pack concrete tightly around pipes and other metal work to prevent leakage and to secure perfect adhesion. Protect drains from intrusion of concrete.

H. Placing concrete in forms:
   1. Deposit concrete in horizontal layers not deeper than 24", and avoid inclined construction joints.
   2. Remove temporary spreaders in forms when concrete has reached the elevation of the spreaders.

I. Placing concrete slabs:
   1. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
   2. Bring slab surfaces to the correct level with a straightedge, and then strike off.
   3. Use bullfloats or darbies to smooth the surface, leaving the surface free from bumps and hollows.
   4. Do not sprinkle water on the plastic surface. Do not disturb the slab surface prior to start of finishing operations.

3.8 CONSOLIDATING CONCRETE

A. General:
   1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
   2. Do not vibrate forms or reinforcement.
   3. Do not use vibrators to transport concrete inside the forms.
   4. Consolidate concrete by means of internal vibrators operated by competent workmen.

B. Utilize vibrators with a minimum head diameter of at least 2 inches, a minimum centrifugal force of 700 pounds and a minimum frequency of 8,000 vibrations per second.

C. On confined areas, supplement the specified vibrators by others having a minimum head diameter of 1-1/2 inches, a minimum centrifugal force of 300 pounds and a minimum frequency of 9,000 vibrations per second.

D. Keep one spare vibrator for each three in use on the site during all concrete placing operations.

E. Insert and withdraw vibrators at points approximately 18 inches apart. The duration of each insertion shall be from 5 to 15 seconds. Do not transport concrete in the forms by means of vibrators.

3.9 REPAIR OF SURFACE DEFECTS

A. Repair surface defects, including tie holes immediately after form removal. Dampen the area to be patched and an area at least 6 inches wide surrounding it to prevent absorption of water from the patching mortar.

B. Remove all honeycombed and other defective concrete down to sound concrete. Cut edges perpendicular to the surface or slightly under cut.

C. Thoroughly dampen surfaces to be patched and apply a coat of bonding grout brushed into the surface. Grout shall consist of one part cement to one part fine sand passing a No. 30 sieve. Grout shall be consistency of thick cream.

D. Make patching mortar of the same materials and of approximately the same proportions used for the concrete except that the coarse aggregate shall be omitted and the mortar shall consist of no more than one part of cement to two and one-half parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. Mix patching mortar in advance and allow to stand, with frequent manipulation with a trowel, without the addition of water, until it has reached the stiffest consistency that will permit placing.

E. After the bonding gout begins to lose its water sheen, apply a premixed patching mortar. Thoroughly consolidate patching mortar into place and strike off so as to leave the patch slightly higher than the surrounding surface. Leave undisturbed for one hour to permit initial shrinkage and then finally finish.

F. After being cleaned and thoroughly dampened, fill tie holes solid with patching mortar.

3.10 JOINTS

A. Expansion joints:

1. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except dowels in floors bonded on only one side of the joints) to extend continuously through any expansion joint.

2. Fill expansion joints full depth with expansion joint material approved by the Architect/Engineer.
3. Tool ALL joints which shall be exposed to view in the finished work.

B. Construction and Crack Control Joints:
1. Provide in concrete slabs on grade galvanized steel screeds for construction joints. Use "Free Flow Screed" concrete screed and stakes as manufactured by Vulcan Metal Products, Inc., or equal by others approved in advance by the Architect. Install in accordance with manufacturer's instructions
2. Control joints shall be saw cuts 1/5 the depth of the slab. Saw cut as soon as possible without raveling concrete (4 to 16 hours after placement). The control joints shall be spaced so that the maximum distance between control joints and control joints and slab edge is approximately 20 feet or where shown on the Drawings. Cut alternate wires of welded wire fabric at control joints.

A. Repair or replace deficient work as directed by the Architect and at no additional cost to the Owner.

END OF SECTION

SECTION 03345
CONCRETE FINISHING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide finishes on cast-in-place concrete as called for on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 03300 – Cast-In-Place Concrete
   3. Section 03370 – Concrete Curing and Sealing

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures sued on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Except as may be modified herein or otherwise directed by the Architect, comply with ACI 301, "Specifications for Structural Concrete for Buildings".

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:
   1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
   2. As required for the Work, provide the following materials, or equals approved in advance by the Architect.

B. Concrete Materials:
   1. Comply with pertinent provisions of Section 03300 and 03370, except as may be modified herein.

C. Liquid Bonding Agent:
   1. "Weld-Crete", manufactured by the Larsen Products Corporation.

D. Curing and Sealing:
   1. Approved Products -
      a) See Section 03370 – Concrete Curing and Sealing.
   2. Where concrete finish will be exposed and will be subjected to abrasion, such as floor slabs, use concrete curing and sealing compound.

E. Liquid Curing Agents:
   1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
   2. For curing other areas see Section 03370 – Concrete Curing and Sealing.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISHING OF FORMED SURFACES

A. General:

1. After removal of forms, give the concrete surface one or more of the finishes specified below where so indicated on the Drawings.
2. Revise the finishes as needed to secure the approval of the Architect.

B. As-Cast Finish:
   1. Rough Form Finish -
      a) Leave the surfaces with the texture imparted by forms, except patch tie holes and defects.
      b) Remove fins exceeding ¼" in height.
   2. Smooth Form Finish -
      a) Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
      b) Patch tie holes and defects.
      c) Remove fins completely.
      d) Rub stair risers with a masonry stone or grind to an even smooth voidless surface.

C. Unspecified Finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.
   1. Rough Form Finish -
      a) For all concrete surfaces not exposed to public view.
   2. Smooth Form Finish -
      a) For all concrete surfaces exposed to public view.

3.3 FINISHING SLABS

A. Definition of Finishing Tolerances:
   1. "Class A" - True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
   2. "Class B" - True plane within ¼" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
   3. "Class C" - True plane within ¼" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.

B. Scratched Finish:
   1. After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.

C. Floated Finish:
   1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
   2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
   3. During or after the first floating, check the planeness of the surface with a ten foot straightedge applied at not less than two different angles.

   4. Cut down high spots and fill low spots, and produce a surface with a Class A tolerance throughout.

5. Refloat the slab immediately to a uniform sandy texture.

D. Troweled Finish:
   1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.
      a) Produce initial surface relatively free from defects, but which still may show some trowel marks.
      b) Provide hand troweling when a ringing sound is produced as the trowel is moved over the surface.
      c) Thoroughly consolidate surface by hand troweling.
   2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.
      a) For concrete on metal deck, Class B tolerance is acceptable.
      b) On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.

E. Broom Finish:
   1. Provide a floated finish as described above.
   2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
   3. Unless otherwise directed by the Architect, provide the texturing in one direction only.
   4. Provide “light”, “medium”, or “coarse” texturing as directed by the Architect or otherwise called for on the Drawings.

F. Unspecified Finish:
   1. If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as applicable -
      a) Scratched Finish:
         i. For surfaces scheduled to receive bond-applied cementitious applications.
      b) Floated Finish:
         i. For surfaces intended to receive roofing.
      c) Steel Troweled Finish:
         i. For floors intended as walking surfaces.
         ii. Floors scheduled to receive floor coverings.
      d) Broom Finish:
         i. Sidewalks
      e) Non-Slip Finish:
         i. Exterior platforms, steps, stair treads and landings.
         ii. Interior and exterior pedestrian ramps.
         iii. Building exterior walkways.

3.4 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.

B. Preservation of Moisture:

1. Unless otherwise directed by the Architect, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing -
    a) Ponding or continuous sprinkling.
    b) Application of absorptive mats or fabric kept continuously wet.
    c) Application of sand kept continuously wet.
    d) Continuous application of steam (not exceeding 150 degrees F) or mist spray.
    e) Application of waterproof sheet materials specified in Part 2 of this Section.
    f) Application of other moisture-retaining covering as approved by the Architect.
    g) Application of the curing or curing and sealing agent specified in Part 2 of this Section or elsewhere in the Contract Documents.
2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
3. Cure concrete by preserving moisture as specified above for at least seven days.

C. Temperature, Wind, and Humidity:
1. Cold Weather -
    a) When the mean daily temperature outdoors is less than 40 degrees F, maintain the temperature of the concrete between 50 degrees F and 70 degrees F for the required curing period.
    b) When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
    c) Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases that contain carbon dioxide.
2. Hot Weather -
    a) When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
3. Rate of Temperature Change -
    a) Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5 degrees F in any one hour period, or 50 degrees F in any 24 hour period.

D. Protection from Mechanical Injury:
1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods by application of curing procedures, and by rain and running water.
3. Do not load self-supporting structures in such a way as to overstress the concrete.

END OF SECTION

SECTION 03370
CONCRETE CURING AND SEALING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide concrete curing and sealing compounds, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 03300 – Cast-In-Place Concrete
   3. Section 03345 – Concrete Finishing.

1.2 SUBMITTALS

A. Submit to the Architect for review and approval information on products proposed to be incorporated in the Work..

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 - PRODUCTS

1. All exterior and interior horizontal concrete slab surfaces including but not limited to ramps, floor deck slabs, walks, drives, etc., when incorporated in the Project; and where indicated on the Drawings shall receive one coat of concrete curing compound, except surfaces to receive coatings or toppings that are not compatible with the curing compound. Curing compound shall be "AR-30" by W.R. Meadows, Inc., "Gardseal" by Lambert Corporation, "Clearbond" by Guardian Chemical Company, "Pro Concrete Cure" by C.G.M., Inc., or compounds approved in advance by the floor covering manufacturer or by the Architect.

2. Provide concrete sealer on the concrete surfaces scheduled to be exposed.

   A. Where concrete floor sealer is called for provide “Glazecoat Sealer” by Lambert Corporation, “Clearbond” by Guardian Chemical Company, “Pro Concrete Sealer” by C.G.M. Inc., “TIAH” by W.R. Meadows, “Clear-Seal” by Concrete Service Materials Company or others approved equal in advance by the Architect.

PART 3 – EXECUTION

3.1 Apply the curing and sealing compounds as soon a practical after final finishing of the concrete surface in strict accordance with the manufacturer’s instructions and recommendations.

END OF SECTION

SECTION 04221
CONCRETE UNIT MASONRY

PART 1 – GENERAL

1.1 SUMMARY

A. Provide concrete unit masonry where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data - Submit to the Architect the following when required:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Store masonry units above ground on level platforms which allow air circulation under the stacked units.

C. Cover and protect against wetting prior to use.

1.5 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 – PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Provide standard weight hollow load-bearing concrete masonry units complying with ASTM C90, normal weight, type II, in color “natural gray”.

B. Dimensions:
   1. Provide units of the dimensions shown on the Drawings.
   2. Where dimensions are now shown on the Drawings, provide units having nominal face dimensions of 16” long by 8” high by the depth shown or otherwise required.

C. Provide bullnose units at all exposed exterior corners of interior walls.

D. Provide necessary shapes as indicated or otherwise required.

E. Provide fire rated block as may be required and as indicated on the drawings.

F. In all exposed finish uninsulated masonry walls at air-conditioned spaces, classrooms, equipment and duct spaces, foam-in-place insulation shall be provided as specified by section 07210 Building Insulation.

2.2 NOT USED

2.3 REINFORCEMENT AND ACCESSORIES

A. Comply with the following as minimums.
   1. Bars: ASTM A615, grade 60, unless otherwise shown on the Drawings, using deformed bars for number 3 and larger.
   2. Bending: ACI 318.
   3. Joint Reinforcement: ASTM A82, ladur type masonry wall reinforcement with deformed galvanized continuous No. 8 side rods and No. 9 cross rods as manufactured by Dur-O-Wal, Inc., or equal. Install in every second course, except where noted otherwise.

B. Fabricate reinforcement in accordance with recommendations contained in DRSI “Manual of Standard Practices”.

2.3 MORTAR

A. Ingredients:
   1. Portland Cement: Comply with ASTM C150, type I.
   2. Lime:
      a) Provide hydrated lime complying with ASTM C207, or quicklime complying with ASTM C5.
      b) When quicklime is used, slake and then screen through a 16 mesh sieve. After slaking and screening, but before using, store and protect for not less than ten days.

3. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter, and complying with ASTM C144.
4. Admixtures: Do not use admixtures unless specifically approved in advance by the Architect.
5. Water: Provide water free from deleterious amounts of acids, alkalis and organic materials.

B. Mixing:
1. Provide mortar type "M" or type "S", as designated on the Drawings or otherwise directed by the Engineer, and in accordance with ASTM C270.
2. Proportions:
a) For type "M" mortar, provide one part portland cement to ¼ part hydrated lime and 3-3/4 parts sand by volume.
b) For type "S" mortar, provide one part portland cement to ½ part hydrated lime and 4-1/2 parts sand by volume.
3. Mechanically mix in a batch mixer for not less than three minutes, using only sufficient water to produce a mortar which is spreadable and of a workable consistency.
4. Retemper mortar with water as required to maintain high plasticity.
a) On mortar boards, retemper only by adding water within a basin formed with mortar and by working the mortar into the water.
b) Discard and do not use mortar which is unused after 1-1/2 hours following initial mixing.

C. Prepared mortar mix may be used. Accepted manufacturers: Rinker Mortar Mix, Florida Super Masonry Cement.

2.4 GROUTING

A. Perform grouting in strict accordance with the provisions of the governing building code and these Specifications:
1. Solidly fill vertical cells containing reinforcement with pump grade masonry grout mix for a 2" diameter pump. Grout shall be minimum compression strength of 2000 psi.
2. Masonry walls shall cure at least three days to gain strength before grouting.
3. Consolidate grout at time of pour by pudding with a mechanical vibrator, filling all cells of the masonry where required.
4. Tap the form covering the inspection openings with a hammer during the filling of the cell with concrete.
5. When grouting is stopped for one hour or longer, the grout shall be stopped 1-1/2" below the uppermost unit.
6. Grout shall be poured in lifts not to exceed 4 feet maximum.
7. Grout shall be in accordance with ASTM C476.

PART 3 – EXECUTION

A. Should this section of this Specification conflict with the Project Engineers Specifications for work designed by the Project Structural Engineer, use the Engineer's Specification.

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 ENVIRONMENTAL CONDITIONS

A. Do not place masonry units when air temperature is below 40 degrees F.

B. Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F in the shade, with relative humidity less than 50%.

3.3 INSTALLATION

A. General:
   1. Do not commence installation of the work of this Section until horizontal and vertical alignment of foundation is within 1” of plumb and the lines shown on the Drawings.
   2. Lay only dry masonry units.
   3. Use masonry saws to cut and fit masonry units.
   4. Set units plumb, true to line, and with level courses accurately spaced.
   5. Clean the top surface of foundation free from dirt, debris, and laitance, and expose the aggregate prior to start of installing first course.
   6. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.
   7. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.
   8. Keep the sand supply covered when not in use to maintain a uniform moisture content for job site mortar mixing.

B. Unless otherwise shown on the Drawings, provide running bond with vertical joints located at center of masonry units in the alternate course below.

C. Do not use chipped or broken units.

D. Laying up:
   1. Place units in mortar with full shoved bed and head joints.
   2. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.
   3. Hold racking to an absolute minimum.
   4. Provide cleanouts at the bottom of each cell of hollow units at vertical reinforcing for removing mortar droppings. Do not close the cleanouts until they have been inspected and approved by the Building Official.

E. Reinforcement:
   1. Provide vertical reinforcement as shown on the Drawings, fully embedded in grout and not in mortar or mortar joints.
   2. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

3. Joint Reinforcement: ASTM A82, ladur type masonry wall reinforcement with deformed galvanized continuous No. 8 side rods and No. 9 cross rods as manufactured by Dur-O-Wal, Inc., or equal approved by the Architect. Install in every second course.
4. Bending: ACI 318.

F. Tooling:
1. Tool exposed joints to a smooth surface with a “concave” pattern, unless otherwise noted.

3.4 GROUTING

A. Perform grouting in strict accordance with the provisions of the governing building code.
1. Solidly fill vertical cells containing reinforcement.
2. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.
3. Grout shall be placed in lifts not to exceed 4 feet maximum.

3.5 CLEANING

A. Inspection and adjustment:
1. Upon completion of the work of this Section, make a thorough inspection of installed masonry and verify that units have been installed in accordance with the provisions of this Section.
2. Make necessary adjustments.

B. Clean surfaces of masonry as required for proper application of the specified finishes.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SUMMARY

A. Provide structural steel as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 05500 – Metal Fabrications

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Producers' or manufacturers' specifications and installation recommendations for the following products, including laboratory test reports and other data required to prove compliance with the specified requirements.
      a) Structural steel, including certified copies of mill test reports covering chemical and physical properties.
      b) High strength bolts, including nuts and washers.
      c) Unfinished bolts and nuts.
      d) Structural steel primer paint.
   2. Shop Drawings including complete details and schedules for fabrication and shop assembly of members.
      a) Include details of cuts, connections, camber, holes, and other pertinent data.
      b) Indicate welds by AWS symbols, and show size, type, and length of weld.
      c) Provide setting drawings, templates, and directions for installing anchor bolts and other required anchors.
      d) Identify details by reference to sheet and detail number of the Drawings.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedures".

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Delivery and Storage:
   1. Deliver materials to the job site properly marked to identify the location for which they are intended.
   2. Use markings corresponding to markings shown on the approved Shop Drawings.
   3. Store in a manner to maintain identification and to prevent damage.

1.5 SPECIFICATION CONFLICTS

A. Whenever there is a conflict between the Architect and Engineer's specifications, the Engineer's specification shall supersede the Architect's requirements, unless directed otherwise by the Architect.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Rolled Steel Shapes, Plates and Bars:
   1. Comply with ASTM A36.

B. Steel Pipe:
   1. Comply with ASTM A53, type E or S, grade B and, where applicable, API-5L, grade B.

C. Steel Tube:
   1. Comply with ASTM A501.

D. Anchor Bolts:
   1. Comply with ASTM A307, headed type with heavy hexagonal nuts unless otherwise indicated.

E. Unfinished Threaded Fasteners:
   1. Comply with ASTM A307, grade A, regular low carbon steel bolts and nuts.
   2. Provide either hexagonal or square heads and nuts, except use only hexagonal units for exposed connections.

F. High Strength Threaded Fasteners:
   1. Provide heavy hexagonal structural bolts, heavy hexagonal nuts, and hardened washers, all from quenched and tempered medium carbon steel complying with ASTM A325.

G. Primer:
   1. Use "10-99 Tnemec Primer", "Rustoleum No. 5769 Primer", Grey in color, or equal approved in advance by the Engineer.

H. Electrodes for Welding:
   1. Comply with AWS Code, using AWS A5.1 or A5.5 E70XX electrodes.

2.2 FABRICATION

A. Shop Fabrication and Assembly:
   1. Fabricate items of structural steel in accordance with AISC specifications, and as indicated on the approved Shop Drawings.
   2. Properly mark and match-mark materials for field assembly and for identification as to location for which intended.
   3. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
   4. Where finishing is required, complete the assembly, including welding of units, before start of finishing operations.
   5. Provide finish surfaces of members exposed in the final structure free from markings, burrs, and other defects.

B. Connections:
   1. Provide bolts and washers of types and sizes required for completion of field erection.
   2. High strength bolted construction –
      a) Install high strength threaded fasteners in accordance with AISC “Specifications for Structural Joints Using ASTM A325 or A490 Bolts”.
      b) Use A325N bolts unless noted otherwise.
   3. Welded construction –
      a) Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welded work.
   4. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

C. Holes for Other Work:
   1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on the approved Shop Drawings.
   2. Provided threaded nuts welded to framing, and other specialty items as shown, to receive other work.
   3. Cut, drill, or punch holes perpendicular to metal surfaces.
   4. Do not flame cut holes or enlarge holes by burning.
   5. Drill holes in bearing plates.

2.3 SHOP PAINTING

A. General:
   1. Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar.
   2. Paint embedded steel which is partially exposed on the exposed portions, and the initial 2” of embedded areas only.
   3. Do not paint surfaces which are to be welded or high-strength bolted with friction type connections.
   4. Apply two coats of paint to surfaces which are inaccessible after assembly or erection. Change color of the second coat to distinguish it from the first.

B. Surface Preparation
   1. After inspection and before shipping, clean steelwork to be painted.
   2. Remove loose rust, loose mill scale, and spatter, slag, and flux deposits.
   3. Clean steel in accordance with Steel Structures Painting Council SP-3, “Power Tool Cleaning”.

C. Painting:
   1. Immediately after surface preparation, apply structural steel primer paint in accordance with the manufacturer’s recommendations and at a rate to provide a uniform dry film thickness.
   2. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with AISC specifications and “Code of Standard Practice”, except as may be modified herein.

B. Anchor Bolts:
   1. Provide anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
   2. Provide templates and other devices necessary for presetting bolts and anchors to accurate locations.

C. Bases and Bearing Plates:
   1. Shop weld to columns and members attached to concrete.

D. Splicing:
   1. Splice members only where indicated unless, with the Architect’s approval, splices not indicated would result in lower costs due to reduced shipping expense.
   2. For splices not indicated, submit structural calculations prepared and signed by a professional engineer licensed to practice where the structure is located.

E. Gas Cutting:
   1. Do not use gas cutting torches for correcting fabricating errors in the structural framing.
   2. Cutting will be permitted only in secondary members as acceptable to the Architect.
   3. When gas cutting is permitted, finish the gas cut section to a sheared appearance acceptable to the Architect.

F. Surveys:
   1. Establish permanent benchmarks necessary for accurate erection of structural steel.
   2. Check elevations of concrete surfaces, and locations of anchor bolts and similar items, before erection proceeds.

G. Temporary Shoring and Bracing:
   1. Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads.
   2. Provide temporary guy lines to achieve proper alignments of the structure as erection proceeds.
   3. Remove temporary connections and members when permanent members are in place and the final connections have been made.

H. Setting Bases and Bearing Plates:
   1. Clean concrete bearing surfaces free from bond-reducing materials, and then roughen to improve bond to the surface.
   2. Clean the bottom surface of base and bearing plates.
   3. Set loose and attached base plates and bearing plates for structural members in wedges or other adjusting devices.
   4. Tighten anchor bolts after the supported members have been positioned and plumbed.
   5. Do not remove wedges or shims but, if protruding, cut off flush with the edge of the base or bearing plate prior to packing with grout.
   6. Pack non-shrink grout solidly between bearing surfaces and bases or plates to assure that no voids remain.
   7. Finish exposed surfaces, protect installed materials, and allow to cure in strict compliance with the manufacturer's recommendations as approved by the Engineer.

I. Field Assembly:
   1. Set structural frames accurately to the lines and elevations indicated.
   2. Align and adjust members forming part of a complete frame or structure before fastening permanently
   3. Clean the bearing surface, and other surfaces which will be in permanent contact, before assembly.
   4. Adjust as required to compensate for discrepancies in elevation and alignment.
   5. Level and plumb individual members of the structure within specified AISC tolerances.
   6. Establish required leveling and plumbing measurements on the mean operating temperature of the structure, making allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
   7. Comply with AISC specifications for bearing, adequacy of temporary connections, alignment, and the removal of paint on surfaces adjacent to welds.

3.3 WELDING INSPECTION

A. Unless otherwise specified, perform welding under observation of a qualified inspector from a testing laboratory approved by the Engineer. Testing shall be performed as requested by the Engineer or Architect.

B. Inspect every layer of weld for quality, penetration, and conformity with design requirements.

C. Require the welding inspector to submit a signed report to the Engineer verifying that:
   1. The welding is adequate and as performed in conformity with the specified requirements.
   2. Adequate methods have been used to determine the quality of the welding.

D. The welding inspector may use gamma ray, magnaflux, trepanning, or any other aid to visual inspection considered necessary to assure adequacy of welding, or may use ultrasonic testing performed in accordance with pertinent requirements of governmental agencies having jurisdiction.

E. Cost of welding inspection will be paid by the General Contractor.

3.4 ACCESS

A. Provide access for the testing agencies and inspectors to places where structural steel work is being fabricated or produced, so that required testing and inspecting may be accomplished.

3.5 ERECTION INSPECTING

A. The General Contractor's testing and inspecting agency will inspect high strength bolted connections, will visually inspect field welded connections, will perform such additional tests and inspections of field work as are required by the Architect, and will prepare test reports for the Engineer's review.

B. The testing agency will conduct and interpret the tests, and will state in each report whether the inspected work complies with the requirements, specifically stating all deviations therefrom.

3.6 CORRECTIONS

A. Correct deficiencies in structural steel work which inspections and test reports indicate to be not in compliance with the specified requirements.
B. Perform additional tests required to reconfirm noncompliance of the original work and to show compliance of corrected work, all at no additional cost to the Owner.

3.7 FIELD PAINTING

A. General:
   1. Prepare surfaces in a manner appropriate to the condition, and as approved by the Engineer.
   2. Clean spots and surfaces where primer coats have been removed, damaged, or burned off, and clean field bolts and other field connections not concealed in the finished Work.
   3. Remove dirt, oil, and grease.
   4. Apply a spot coat of the approved primer.
   5. Do not apply paint to wet, damp, oily, or improperly prepared surfaces.

B. Notify the Engineer when the work of this Section is ready to receive field painting.
   1. Secure inspection and approval by the Engineer prior to field painting.
   2. Using spray or brush, as recommended by the manufacturer of the approved paint material, fill all joints and corners and cover the surfaces with a smooth unbroken film of at least 1.5 dry mils thickness.

END OF SECTION

SECTION 05400
METAL FRAMING SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide light gauge metal exterior wall framing, roof framing and accessories as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Date - Submit to the Owner the following when required:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Delegated Engineer drawings with design of the metal framing system and calculations signed and sealed by a licensed Florida Engineer.
   4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Light gauge steel framed systems exposed to wing loads shall be designed by a delegated engineer licensed in the State of Florida.

C. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in"Specifications for Metal Lathing and Furring" published by the Metal Lath/Steel Framing Association.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 METAL STUDS AND ACCESSORIES

A. Meet or exceed minimum requirements of Fed Spec QQ-S-698 and Fed Spec QQ-S-775d, class d, for the item and use intended.

B. Metal studs and Framing:
   1. At exterior metal stud framing, unless otherwise shown on the Drawings, provide standard punched steel studs of the gages shown on the Drawings, or if not shown, utilize minimum 18 gauge studs, hot-dip galvanized. Studs shall have 2" legs.
   2. Exterior metal framing systems spanning 6'-0" or greater shall be designed by a specialty engineer as required by the Structural drawings.
   3. See Drawings for additional information.

C. Metal roof framing:
   1. All metal framing members shall be of the type, size and gauge as shown on the plans. See Structural Drawings.

D. Accessories:
   1. Provide all accessories including, but not necessarily limited to tracks, clips, anchors, fastening devices, and other accessories required for a complete and proper installation, and as recommended by the manufacturer of the steel studs used.

E. Grade:
   1. All galvanized 18 and 20 gauge structural framing, track, bridging, end closures and accessories shall be formed from steel that corresponds to the requirements of ASTM A653, AQ Grade 33, with a minimum yield of 33,000 psi.

F. Galvanizing:
   1. All framing members shall be formed from steel having a G-60 galvanized coating or equivalent, meeting ASTM A653 and C955.

G. Manufacturers: Dale/Incore Industries, National Gypsum Company, Gold Bond Building Products, Unimast, Inc., or W.S.G. Corporation.

2.2 GROUT

A. Provide a good grade of commercial cement leveling compound for leveling the floor runner member of steel stud partitions as required.

2.3 FABRICATION

A. Framing components may be pre-assembled into panels prior to erecting. Prefabricated panels shall be square with components attached in a manner as to prevent racking.

B. All framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

C. Provide insulation equal to that specified elsewhere in all double header members which will not be accessible to the insulation contractor.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Accurately layout wall lines from the dimensions shown on the Drawings.

B. Install metal framing studs and accessories in strict accordance with the manufacturer's recommendations, anchoring all components firmly into position.

C. Align all assemblies to a tolerance of one in 200 horizontally and one in 500 vertically.

D. Coordination:
   1. Space the studs as required for compliance with pertinent regulations, to give proper support for the covering material, and as indicated on the Drawings.
   2. Coordinate and provide required backing and other support for items to be mounted on the finished covering.
   3. Coordinate requirements for pipes, grilles, ducts, scuppers and other items.
   4. Brace all walls to the structural systems with same stud material. The bracing shall be installed perpendicular to the partitions with a maximum spacing of 4 feet on center and a maximum angle of 45 degrees from the horizontal. If necessary, provide horizontal members across the structural members for bracing support to comply with the above requirements.

3.3 LEVELING

A. By use of the cement leveling compound, or by other means approved, provide continuous solid bearing under floor runner members of steel stud partitions and walls.

B. Level in a manner to provide uniform interface with ceilings and other overhead construction.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 MATERIALS

A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, rolled trade names, and roughness.

B. Comply with following standards, as pertinent:
   1. Steel Plates, Shapes, and Bars - ASTM A36
   2. Steel Plates to be bent or cold-formed - ASTM A283, Grade C
   3. Steel Tubing (hot-formed, welded, or seamless) - ASTM A501
   4. Steel Bars and Bar-size Shapes - ASTM A306, Grade 65, or ASTM A36
   5. Cold-Finished Steel Bars - ASTM A108
   6. Cold-Rolled Carbon Steel Sheets - ASTM A336
   7. Galvanized Carbon Steel Sheets - ASTM A526, with G90 zinc coating in accordance with ASTM A525
   8. Stainless Steel Sheets - AISI type 302 or 304, 24 gauge, with number 4 finish
   9. Gray Iron Castings - ASTM A48, Class 10
   10. Malleable Iron Castings - ISTM A47
   11. Steel Pipe - ASTM A53, Grade A, Schedule 40, black finish unless otherwise noted
   12. Concrete Inserts –
      a) Threaded or wedge type galvanized ferrous castings of malleable iron complying with ASTM A27.
      b) Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.

2.2 FASTENERS

A. General:
   1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.
   2. Provide fasteners of type, grade, and class required for the particular use.

B. Comply with following standards as pertinent:
   1. Bolts and Nuts - Provide hexagon-head regular type complying with ASTM A307, grade A.
   2. Lag Bolts - Provide square-head type complying with Fed Spec FF-B-561.
   3. Machine Screws - Provide cadmium plated steel type complying with Fed Spec FF-S-111.
   4. Washers –
      a) Plain Washers: Comply with Fed Spec FF-W-92, round, carbon steel.
      b) Lock Washers: Comply with Fed Spec FF-W-84, helical spring type, carbon steel.
   5. Toggle Bolts - Provide type, class, and style needed but complying with Fed Spec FF-B-588.
   6. Anchorage Devices - Provide expansion shield complying with Fed Spec FF-S-325.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

2.4 SHOP PAINT

A. Shop Primer for Ferrous Metal:
   1. 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. Use "10-99 Tnemec Primer", "Rustoleum Number 5769 Primer" or "Zinc Chromate Primer", Grey color.

C. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

2.5 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. Fabricate with accurate angles and surfaces which are true to the required lines and levels, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

C. Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item.

D. On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

F. Shop Assembly:
   1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
   2. Disassemble units only as necessary for shipping and handling limitations.
   3. Use connections that maintain structural value of joined pieces.
   4. Clearly mark units for reassembly and coordinated installation.

G. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

I. Close all open ends of tubes and pipes.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.3 INSTALLATION

A. General:
   1. Set work accurately into position, plumb, level, true, and free from rack.
   2. Anchor firmly into position.
   3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.
   4. Grind exposed welds smooth, and touchup shop prime coats.
   5. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

B. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

END OF SECTION

SECTION 05600

METAL PIPE GUARDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 SUMMARY:

A. Provide all material, labor, equipment and services and perform all operations necessary or required for installation of metal pipe guardrails and railings where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.
2. Section 05500: Metal Fabrications.

C. System Performance Requirements:

1. Structural Performance of Handrails and Railing Systems -
   a) Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.
2. Structural Performance -
   a) Design, engineer, fabricate, and install the following metal fabrications to proper widths and the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
   b) Apply each load to produce the maximum stress in each respective component of each metal fabrication.
3. Top Rail of Guardrail Systems - Capable of withstanding the following loads applied as indicated:
   a) Concentrated load of 200 lbs. Applied at any point nonconcurrently, in any direction at the top of the guardrail.
   b) Guardrail systems shall be designed and constructed for a load of 50 plf applied horizontally at the required guardrail height and a simultaneous load of 100 plf applied vertically downward at the top of the guardrail.
   c) The guardrail systems shall also be designed and constructed to resist a 200 lb concentrated horizontal load applied on a 1 ft. square area at any point in the system including intermediate rails, infill or other elements serving this purpose.
   d) Above load need not be assumed to act concurrently with uniform horizontal loads on top rails of railing systems in determining stress on guardrail components.

1.3 SUBMITTALS

A. General:
   1. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
      a) Product data for products used in miscellaneous metal fabrications, including paint products and grout.
      b) 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.
      c) 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.
      d) Samples representative of materials and finished products as may be requested by the Architect.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications:
   1. Firms 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:
   1. 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”, D1.2 “Structural Welding Code – Aluminum”, D1.3 “Structural Welding Code – Sheet Metal”.

1.5 PROJECT CONDITIONS

A. Field Measurements:
   1. Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication.
   2. Show recorded measurements on final shop drawings.
   3. Coordinate fabrication schedule with construction progress to avoid delay of Work.
   4. Where field measurements cannot be made without delaying the Work -
      a) Guarantee dimensions and proceed with fabrication of products without field measurements.
      b) Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.
      c) Allow for trimming and fitting.

PART 2 – PRODUCTS

2.1 COMPONENTS

A. Ferrous Metals
   1. Metal Surfaces – General -
      a) For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes.
      b) 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.
   2. Steel Tubing - Product type (manufacturing method) and as follows:
      a) Cold-Formed Steel Tubing: ASTM A500; Grade A, unless otherwise indicated or required for design loading.
      b) Hot-Formed Steel Tubing: ASTM A501
         (i) For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.
   3. Uncoated Structural Steel Sheet - Product type (manufacturing method), quality, and grade as follows -
      a) Cold-Rolled Structural Steel Sheet: ASTM A611; Grade A, unless otherwise indicated or required by design loading.
      b) Hot-Rolled Structural Steel Sheet: ASTM A570; Grade 30, unless otherwise indicated or required by design loading.
   4. Steel Pipe -
      a) ASTM A53; Galvanized finish for exterior installations and where indicated.
      b) Type S, Grade B, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
   5. Malleable Iron Castings -
      a) ASTM A47, Grade 32510
   6. Brackets, Flanges and Anchors -
      a) Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
   7. Concrete Inserts -
      a) Threaded or wedge type
      b) Galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27
      c) Provide hot-dip galvanized (per ASTM A153) bolts, washers, and shims as required.
   8. Welding Rods and Bare Electrodes -
      a) Select in accordance with AWS specifications for the metal alloy to be welded.

B. Grout and Anchoring Cement:
   1. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE
   2. CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section.
   3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include but are not limited to the following:

C. Paint:
   1. 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.
   2. Zinc Chromate Primer - FS TT-P-645.

2.2 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 components of each metal 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. Shear and punch metals cleanly and accurately. Remove burrs.

D. 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.

E. Remove sharp or rough areas on exposed traffic surfaces.

F. 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. Remove welding flux immediately.
   3. 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.

G. 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 flathead (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

I. Shop Assembly:
   1. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
   2. Disassemble units only as necessary for shipping and handling limitations.
   3. Use connections that maintain structural value of joined pieces.
   4. Clearly mark units for reassembly and coordinated installation.

J. General:
   1. Construct guardrails and railings to conform to sizes and arrangements indicated.
   2. Join pieces together by welding, unless otherwise indicated.
   3. Provide complete railing assemblies, including metal railings, newels, balusters, struts, clips, brackets, and other components necessary for the support of railings.
   4. Provide removable sections where required on the Drawings.

K. Not Used

L. Not Used.

M. Railings may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.

N. Grout railing posts into concrete.

O. Close all exposed open ends.

2.3 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Finish metal fabrications after assembly.

2.4 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for:
   1. SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications.

B. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, or masonry, unless otherwise indicated.

PART 3 – EXECUTION

3.1 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.

3.2 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, and other connectors as required.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

C. 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.

3.3 ADJUSTING AND CLEANING

A. Touch-Up Painting:
   1. 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.
   2. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touch-Up Painting:
   1. Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9, Section “Painting” of these Specifications.
   2. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION

SECTION 05999

MISCELLANEOUS METALS AND FABRICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.2 WORK INCLUDED

A. Includes the furnishing and installation of all items of miscellaneous metals shown on Drawings, herein specified, and/or metal and steel work not included in other Sections of these Specifications.

B. The current rules and practice set forth in the AISC Specifications and the AISC Code shall govern this work, except as modified herein.

C. Welding shall be in accordance with AWS. All welding shall be done by welders with current certificates for the type of joint being made. Special care shall be taken to keep welding electrodes free from moisture.

1.3 RELATED SECTIONS

A. Section 09900 - Painting.

B. Section 10050 - Specialty Products.

1.4 QUALITY ASSURANCE

A. 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. Clearly mark units for reassembly and coordinated installation.

B. Field Measurements: Field verify all dimensions prior to fabrication to ensure proper fit and sizing.

1.5 SUBMITTALS

A. Product Data: In accordance with Section 01340; submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: In accordance with Section 01340; indicate fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

C. Samples: Submit two (2) sets of representative samples of materials and finished products

as may be requested by Architect.

D. Submit current valid welders' certificates for all personnel who will be performing welding either in shop or field.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to prevent damage and marked to indicate use and location intended.

B. Store materials on site, protected from the elements, covered, ventilated, above ground on wood blocking and in a manner to prevent damage, rust or exposure to moisture.

C. Repair, repaint or replace any damaged, rusted, or otherwise faulty materials at no additional cost to Owner.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS STEEL

A. Frames, weld plates, anchors, bolts, pipe sleeves, and inserts not specified in other Sections shall be provided where required, or where necessary for supporting or securing work in place. Sizes, kinds and spacing of bolts and/or anchors not indicated or specified shall be as directed. All anchors, bolts, sleeves, etc. set in concrete or masonry shall be zinc-coated. Expansion and toggle bolts, where required, shall be of approved types and sizes, galvanized or non-ferrous, and be used in all places where practicable.

B. Miscellaneous structural steel shapes, including elevator and equipment support, shall be ASTM A36 and of type and size shown on Drawings, required by manufacturer of product being anchored or supported, or as otherwise required to provide adequate strength, stability and stiffness.

C. Miscellaneous steel members, shapes, anchors, grounds, ledgers, lintels, and frames not specified but indicated about openings and other locations, shall be formed of hot or cold-rolled steel angles or channels, bent steel plates or other shapes as required. Metal angle and/or channel overhead supporting frames for windows, toilet partitions, moveable partitions, or other overhead supported or mounted equipment or construction shall be provided and shall be, when secured to structure above, of sufficient strength and rigidity to resist normal vertical and lateral loads for the application which may reasonably be expected, including wind loads in excess of 40 PSF for exterior applications. Shapes, sizes and gauges shall be as noted on Drawings. Where sizes or gauges are not noted, they shall be not less than 1/8" thick for angles, channels or bent steel plates; 12 gauge for other shapes; required for the application for which they are intended or established by standard trade practices; or required for adequate strength for the application.

D. Fastening not otherwise noted or specified shall be 3/8" minimum expansion or toggle bolts, or other fastenings approved by the Architect. Provide bolts or other fastenings as required and approved by the Architect. Provide threaded holes where required. Size and spacing of fastener shall be as recommended by manufacturer for load imposed.

E. Steel shall conform to ASTM A27 for cast steel. Architectural and miscellaneous steel not otherwise indicated or specified shall be mild steel.

F. Steel shall be well formed to shape and size, with sharp lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections. Curved work shall be evenly sprung. For exposed members, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

G. Fastenings shall be concealed where practicable, thickness of metal and details of assembly and supports shall give ample strength and stiffness.

H. Galvanizing shall conform to ASTM Standards A123 and/or A153 as applicable. Heavier coatings where specifically specified shall be provided. Galvanize after fabrication unless specified otherwise. After welding, repair burned coatings by metalizing with zinc or painting with an approved galvanizing paint.

2.2 MISCELLANEOUS ALUMINUM

A. Extruded aluminum shall be alloy 6063 or 6061, unless otherwise specified. Temper shall be as best suited for working.

B. Aluminum sheet and plate shall be alloy 3003 or 5005, unless otherwise specified. Temper shall be as best suited for working.

C. Aluminum castings shall be alloy 43, 214 or 356, appropriate to strength required and appearance of required finish.

2.3 METAL FINISHES

A. Provide exposed metal finishes with appropriate sealant, except as otherwise specified or noted.

B. Steel and Iron:
   1. Surfaces of steel and iron work for which no priming or other finish is specified, shall be cleaned free from scale, rust, oil and grease and given one (1) coat of light colored shop paint ready for subsequent field painting. Paint all contact surfaces of assembled work (work welded contact surfaces) with additional shop coat of similar paint.
   2. For paints and their application, except where baked-on prime coat is specified, see Section 09900 - Painting.
   3. Omit shop painting from ferrous metals which will be concealed in finished work unless otherwise specified, or used at exterior wall locations or outdoors.
   4. Dip hangers and bolts (except threads) in red lead, immediately before use. Touch up abrasions of shop coat on structural shapes with red lead.
   5. All metals used in exterior locations shall have a protective finish to inhibit rust, corrosion, etc.

C. Stainless Steel: Finish numbers are in accordance with latest issue and amendments and revisions thereto of the National Association of Architectural Metal Manufacturer's designation system as follows:
   1. Mechanical Finishes:
      a. No. 4 on sheet.
      b. No. 7 on tubing.

D. Aluminum:

1. Finish numbers for aluminum specified herein are in accordance with the Aluminum Association's Designation System and shall comply with the latest issue and amendments and revisions thereto. Each aluminum finish number preceded by letters AA identifies it as an Aluminum Association designation.
2. Mechanical and Chemical Finishes:
   a. AA-MIX - Mechanical finish applied to aluminum to provide a clean surface reasonably uniform in color and free from serious surface blemishes.
   b. AA-M-32 - Mechanically applied directional textured medium satin finish in preparation for anodic finishes.
   c. AA-C22 - Chemically applied medium matte finish preparation for anodic finishes.
3. Anodized finishes (anodic coatings) as indicated on Drawings or Specifications shall be:
   a. Clear (Natural) Finish:
      1) AA-A31 Architectural Class II coating with 0.4 mil. to 0.7 mil. thickness to be applied only to items not subject to wear, abrasion or frequent maintenance care.
      2) AA-A41 Architectural Class I coating with 0.7 mil. or greater thickness to be applied to all items subject to wear and unless otherwise specified.

   b. Black, light, medium or dark bronze, or other colors indicated on Drawings or Specifications which are integral colors:
      1) AA-32 Architectural Class II coatings with same criteria as specified above.
      2) AA-42 Architectural Class I coatings with same criteria as specified above.
4. Exposed fastenings shall have finishes to match material in which installed, and shall be compatible with the material in which installed.

2.4 FASTENERS

A. General:

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.
2. Provide fasteners of type, grade, and class required for the particular use.

B. Comply with following standards as pertinent:

1. Bolts and Nuts - Provide hexagon-head regular type complying with ASTM A307, grade A.
2. Lag Bolts - Provide square-head type complying with Fed Spec FF-B-561.
3. Machine Screws - Provide cadmium plated steel type complying with Fed Spec FF-S-111.
4. Washers –
   a) Plain Washers: Comply with Fed Spec FF-W-92, round, carbon steel.
   b) Lock Washers: Comply with Fed Spec FF-W-84, helical spring type, carbon steel.
5. Toggle Bolts - Provide type, class, and style needed but complying with Fed Spec FF-B-588.
6. Anchorage Devices - Provide expansion shield complying with Fed Spec FF-S-325.

2.5 ACCESSORY ITEMS

A. Grout:
1. Non-Shrink, Non-Metallic Grout: Pre-mixed, factory-packaged non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this Section. See also Section 03720 - Concrete Patching, Leveling and Grouting.

B. Paint:
1. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, rust inhibitive 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-664.
2. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, complying with FS TT-P-641 and SSPC-PS-1200-68T.

2.6 LOOSE STEEL LINTELS

A. Provide 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 4 inches bearing at each side of openings, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

E. Field Welding:
1. 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:
a) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

PART 3 - EXECUTION

3.1 FABRICATION

A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated on Shop Drawings or as required in field, using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.
1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
2. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

3. 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. Finish shall match that of adjacent exposed material.
4. Provide for anchorage of type indicated, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
5. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.
6. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:
   a. ASTM A153 for galvanizing iron and steel hardware.
   b. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
   c. ASTM A386 for galvanizing assembled steel products.
7. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

B. Shop Painting:
1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete or masonry, unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
2. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   a. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning".

3.2 WORKMANSHIP

A. Materials and workmanship shall conform to the accepted standard practices of the trades. Supplementary parts necessary to complete each item shall be furnished and installed.

B. Templates and patterns for proper fitting of hardware and other accessories shall be used wherever practicable.

3.3 PROTECTION OF ALUMINUM

A. Aluminum in contact with, or fastened to dissimilar metals other than stainless steel, white bronze, or other metals compatible with aluminum shall be isolated either by:
1. Painting the dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two (2) coats of aluminum paint.
2. Painting the dissimilar metal with a coating of heavy-bodied bituminous paint.
3. Applying caulking placed between aluminum and the dissimilar metal.
4. A non-absorptive tape or gasket, when installed in permanently dry locations.

B. Paint aluminum surfaces in contact with lime mortar, concrete, plaster, or other masonry materials with heavy-bodied bituminous (bitumastic) paint.

C. Paint aluminum surfaces in contact with absorptive materials that may become repeatedly wet with two (2) coats of heavy-bodied bituminous (bitumastic) paint, or two (2) coats of aluminum paint.

3.4 CONNECTIONS

A. Except as otherwise specified, connections may be made by welding. No field riveting will be permitted except as approved by Architect.
   1. Welding: Shall be done in accordance with latest edition of American Welding Society Publications "Standard Code for Arc and Gas Welding in Building Construction".
   2. Riveting: Rivets, where specifically approved, shall be hot-driven by power riveters.

3.5 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.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. For Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780 and FS TT-P-641.

C. For other surfaces, clean all dirt, debris, rust, etc. from surfaces prior to enclosing in work, finishing or attaching additional materials.

D. Repair or replace any damaged materials at no additional cost.

PART 4 - MISCELLANEOUS PRODUCTS

4.1 PROVIDE AND INSTALL THE FOLLOWING ITEMS AS SPECIFIED HEREIN AND AS SHOWN ON DRAWINGS

A. Exterior and interior railings secured to walls, unless noted otherwise, shall be fabricated per Section 05521 Aluminum Pipe Guardrails and Railings and Section 05600 – Metal Pipe Guardrails and Railings.

B. Steel lintels and shelf angles shall be hot-dip galvanized steel shapes of sizes as shown on Drawings. Where no sizes are shown, provide proper size to adequately support intended loads.

C. Galvanized anchor bolts.

END OF SECTION

SECTION 06010
LUMBER

PART 1 – GENERAL

1.1 SUMMARY

A. Provide, if required, wood, nails, bolts, screws, framing anchors and other hardware, and other items required for rough and finish carpentry as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 06100 – Rough Carpentry
   3. Section 06200 – Finish Carpentry

1.2 QUALITY ASSURANCE

A. Codes and Standards:
   1. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, unless otherwise specifically directed or permitted by the Architect comply with:
      a) "Product Use Manual" of the Western Wood Products Association for selection and use of products included in that manual.
      b) "Plywood Specification and Grade Guide" of the American Plywood Association.
      c) "Standard Specifications for Grades of California Redwood Lumber" of the Redwood Inspection Bureau for Redwood, when used.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Protection:
   1. Deliver the materials to the job site and store, in a safe area, out of the way of traffic, and shored up off the ground surface.
   2. Identify framing lumber as to grades, and store each grade separately from other grades.
   3. Protect metals with adequate waterproof outer wrapping.

PART 2 – PRODUCTS

2.1 GRADE STAMPS

A. Identifying framing lumber by the grade stamp of the West Coast Lumber Inspection Bureau, or such other grade stamp as is approved by the Architect.

B. Identify plywood as to species, grade, and glue type by the stamp of the American Plywood Association.

C. Identify other materials of this Section by the appropriate stamp of the agency approved in advance by the Architect.

2.2 MATERIALS

A. Provide materials in the quantities needed for the Work shown on the Drawings, and meeting or exceeding the following standards of quality:
   1. Horizontal framing members: Hem-Fir, Construction grade, or as noted on the Drawings.
   2. Vertical Framing Members: Hem-Fir, Standard grade or Spruce, Stud grade, except where noted otherwise on the Drawings.
   3. Plywood:
      a) Roof Sheathing – 5/8" APA rated sheathing 32/16 5 PLY/ 5 LAYERS Exposure 1 plywood marked "PS 1" with a panel clip at mid span between all trusses. Sheathing under prefabricated membrane roofing shall have two (2) clips between trusses.
      b) Fire Draft Stops – ½" Fir or Pine CDX.
   4. All wood in contact with concrete or masonry – pressure treated S.Y.P.
   5. Building Paper: 15 lb. Asphalt felt perforated.
   6. Roofing Dry-in: 30 lb. unperforated roofing.
   7. Wood Preservative: Ammoniacal copper arsenate (ACA), chromated copper arsenate (CCA) or chromated zinc chloride (CZC).
   8. Rough Hardware:
      a) Steel Items –
         (i) Comply with ASTM A7 or ASTM A36.
         (ii) Use galvanized at all locations.
      b) Machine Bolts – Comply with ASTM A307.
      c) Lag Screws – Electroplated steel with washers.
      d) Nails –
         (i) Use common except as otherwise noted.
         (ii) Use galvanized or "Weatherex" for all rough framing, sheathing, and exterior trim.
         (iii) Use electroplated finish nails on interior trim.
      e) Joist, Beam, and Truss Hangers – Hughes, Simpson, Teco, Basch, or equal as approved in advance by the Architect.
   9. Wood Base and Casing: Ponderosa white pine or fir. Base 3-1/4". Casing 2-1/4". Clam shell style. Finger-joining permitted.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 COMPLIANCE

A. Do not permit materials not complying with the provisions of this Section to be brought onto or be stored at the job site.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 – GENERAL

1.1 WORK

A. Provide and install, if required, wood framing as shown on the Drawings and as specified herein. Work includes all connectors, and related hardware and materials.

B. Where additional instructions are required, work shall be as directed by the Architect.

1.2 QUALITY STANDARDS AND TOLERANCES

A. Provide a work force that is sufficient in number for the quantity of work and time schedule. Workers shall be skilled, trained, experienced and competent to do the work as specified.

B. All work shall be as per building code and the Manual for Wood Frame Construction, American Forest and Paper Association (NFPA), National Design Specifications for Wood Construction of the NFPA, Plywood Specifications and Grade guide of the American Plywood Association.

C. Tolerances: Vertical framing shall be plumb within ¼" per 10 linear feet and horizontal framing shall be level within ¼" per 10 linear feet.

D. Moisture content of framing lumber shall be 19% or less by weight. Kiln-dried or other lumber requiring lower moisture content shall be as specified.

1.3 MATERIALS HANDLING AND STORAGE

A. Reject any delivered framing lumber that is not grade-stamped and certified by a bonafide grading agency. Identify framing lumber by grade and store each grade separately.

B. Do not accept or use lumber that deviates from grade standards or has excessive moisture content or other defects. Remove unstamped or defective lumber from the job site.

C. Follow applicable lumber grading agency standards in accepting or rejecting delivered lumber. Reject special required lumber that is not marked or certified as preservative-treated or kiln-dried.

D. Store framing lumber and wood panels to prevent damage and moisture absorption. Store metal connectors that are subject to damage in weathertight wrapping and in safe locations away from traffic or other sources of damage. Store chemically treated lumber and wood panels outdoors until installation. Keep chemically treated lumber and wood panels well ventilated if moved indoors.

PART 2 – PRODUCTS

2.1 FASTENERS, CONNECTORS, AND SUPPORTS

A. Use hot-dip galvanized steel for exterior, high humidity, and treated wood locations.

B. Nails shall be galvanized common wire or spike nails. Follow all nail size requirements and nail spacings required by the governing building code.

C. Power-driven Nailing: Comply with the standards of the International Staple, Nail and Tool Association. Only full head nails are permitted.

D. Machine bolts shall comply with ASTM A307. Lag bolts to comply with Federal Spec FF-N-1. Drill holes 1/16" larger than bolt diameters. Use washers under all nuts and bolt heads.

E. Staples are not permitted on this project.

2.2 LUMBER

A. S4S, S-Dry unless otherwise indicated, grade marked complying with the following:
   1. Non-structural light framing and blocking – Grade: Standard or better. No utility grade.
   2. Structural light framing – Grade: No. 2 Him-Fir or better.

2.3 SHEATHING AND UNDERLAYMENT: MATERIALS

A. Related Construction and Materials:
   1. Building Paper: 30# non-perforated roofing asphalt felt
   2. Sheathing and underlayment
      a) Plywood Sheathing: Use APA rated, PS-1 or APA PRP-108
      b) Particleboard: Exterior Type 2-M
      c) Hardboard: ANSI/AHA A135.6
      d) Roof Sheathing: CDX plywood. Exterior Grade

2.4 WOOD TREATMENT

A. Provide Wood Preservative as Follows:
   1. Type: CCA 2.5 interior; CCA 4.0 exterior
   2. Location: Wherever wood is in contact with masonry or concrete and where indicated on the drawings.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 WORKMANSHIP

A. Produce joints that are tight, true, and well mailed, with members assembled in accordance with the Drawings and with pertinent codes and regulations.

B. Selection of lumber pieces:
   1. Carefully select the members.
   2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
   3. Cut out and discard defects that render a piece unable to serve its intended function.
   4. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bor, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

C. Do not shim any framing component.

3.3 GENERAL FRAMING

A. General:
   1. Accurately lay out, cut, fit, and install rough carpentry work.
   2. Set roof trusses. Provision of lifting equipment is included in this Section.
   3. In addition to framing operations normal to the fabrication and erection indicated on the Drawings, install wood blocking and backing required for the work of other trades.
   4. Set horizontal and sloped members with crown up.
   5. Do not notch, cut, or bore beam and column members for pipes, ducts, or conduits, or for other reasons except as shown on the Drawings or as specifically approved in advance by the Architect.
   6. Untreated lumber shall not be in contact with concrete or masonry. Provide 26 gauge galvanized sheet steel or minimum 30 pound roofing felt separation if treated lumber is not practical.

B. Bearings:
   1. Make bearings full unless otherwise indicated on the Drawings.
   2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support.
   3. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.4 BLOCKING AND BRACING

A. Install blocking as required to support items of finish work and to cut off concealed draft openings, both vertical and horizontal.

B. Bracing:

1. Install wood cross and longitudinal bracing (not less than 2” x 4” nominal) on trusses in accordance with Truss Plate Institute BWT-26 recommendation and as indicated on the truss shop drawings.

3.5 ALIGNMENT

A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8” from the plane of surfaces of adjacent furring and framing members.

3.6 INSTALLATION OF SHEATHING

A. Placement:
   1. Place sheathing with direction of grain or lay perpendicular to supports and continuously over at least two supports wherever possible, except where otherwise shown on the Drawings.
   2. Center joints accurately over supports, unless otherwise shown on the Drawings.
   3. Install 1 ply clip between all supporting members.
   4. Do not fit end joints tight.

B. Dry-in roof sheathing prior to any rain, preferably at the end of each day the sheathing has been placed.

3.7 FASTENING

A. Nailing:
   1. Use only common galvanized wire nails or spikes of the dimension required by the building code and manufacturer’s recommendation, except where otherwise specifically noted on the Drawings or Specifications.
   2. For conditions not covered in Item 1 above, provide penetration into the piece receiving the point of not less then ½ the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of 2” (nominal) thickness.
   3. Nail without splitting the wood, bore as required.
   4. Remove split members and replace with members complying with the specified requirements.
   5. Sheathing nailing – 8d common galvanized nails spaced 6” o.c. at edges and 12” o.c. at intermediate supports, unless noted otherwise on the Drawings.

END OF SECTION

SECTION 06200
FINISH CARPENTRY AND MILL WORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Install finish wood trim (exterior and interior), doors (wood and steel), frames (steel), signs, finish hardware, toilet room accessories, pull-down stairs, framed mirrors, borrow light, roll-up shutter, Receptionist window counters, shelving, Receptionist counters, fire extinguishers and other items not specifically described as being installed under other Sections of these Specifications.

B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 06010: Lumber.
   3. Section 06100: Rough Carpentry.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workman who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 – MATERIALS AND PRODUCTS

2.1 WOOD AND ACCESSORIES

A. Provide and install materials as per detail drawings, applicable trade standards, or approved samples.

B. Provide wood free of significant defects or deviations from grade standards.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 WORKMANSHIP

A. Produce joints which are true, tight, and well nailed with all members assembled in accordance with the Drawings.

B. Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints.

C. Install trim in pieces as long as possible, joining only where solid support is obtained.

D. Fastening:
   1. Install items straight, true, level, plumb, and firmly anchored in place.
   2. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.
   3. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.
   4. Nail exterior trim with hot-dipped galvanized or “Weatherex” nails, making joints to exclude water.

3.3 INSTALLATION OF OTHER ITEMS

A. Install items in strict accordance with the Drawings, and the recommended methods of the Manufacturer as approved by the Architect, anchoring firmly into position at the prescribed location, straight, plumb, and level.

3.4 FINISHING

A. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in the direction of the grain; except do not sand wood which is designed to be left rough.

3.5 CLEANING UP

A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work.

END OF SECTION

SECTION 06400
ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 SUMMARY

A. Provide prefinished cabinets, vanities, counters, and similar items where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

C. Definitions:
   1. "Exposed work" includes all surfaces visible when doors and drawers are closed.
      a) Bottoms of cases more than 4'-0" above the floor will be considered as exposed.
      b) Visible members in open cases, or behind doors of clear glass, will be considered as exposed.
   2. "Semi-exposed work" includes those members behind opaque doors, such as shelves, divisions, interior faces of ends, case backs, drawer sides, drawer backs and bottoms, and the back face of doors.
      a) Tops of cases 6'-6" or more above the floor will be considered as semi-exposed.
   3. "Concealed work" includes sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades:
      a) Identify cabinets, fixtures, moldings, and other items in accordance with the system used on the Drawings.
      b) Show overall dimensions, and call specific attention to all dimensions and conditions which vary from those shown on the Drawings.
      c) Indicate compliance with the selected Institute standards.

C. Samples:
   1. Accompanying the Shop Drawings, submit Samples of all items of finish hardware, metal work, trim, glasswork, plastic overlays, and similar items proposed to be provided under this Section.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. In addition to complying with all pertinent codes and regulations of governmental agencies having jurisdiction, comply with "architectural Woodwork Quality Standards" of the Architectural Woodwork Institute.

C. Identification of Components:
   1. On a concealed but accessible surface of each item of the work of this Section, plainly stamp the identifying number or numbers shown on the Shop Drawings for that item.
   2. On a concealed but accessible surface of each removable part of each item of the work of this Section, plainly stamp an identifying number or numbers for that item to aid in rapid and efficient identification and reinstallation of removable parts.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Provide additional protection as needed to assure that the work of this Section remains undamaged during fabrication, installation, and the time between completion of installation, and the time between completion of installation and actual acceptance of the total Work.

C. Do not deliver cabinets and fixture materials or products to the job site until concrete and plaster installations are completed and dry, nor until the building interior has attained a relative humidity of 50% to 55% at 70 degrees F.

PART 2 – PRODUCTS

2.1 CABINETS, COUNTERTOPS, AND VANITIES

A. Fabricate and install base cabinets, wall cabinets and countertops in accordance with the details on the Drawings and as specified herein. Quality – AWI "premium" standard:
   1. Cabinet fronts, countertop edges, drawer inside fronts, backs and sides, etc., shall be ¾" thick solid clear fir or white pine material.
   2. Counter tops, vertical dividers, vertical ends, wall cabinet tops and bottoms, base cabinet bottom shelves, doors and drawer fronts, intermediate shelves, backslashes, etc., shall be ¾" thick Industrial Grade, minimum weight 50 pounds per cubic foot, particle board or ¾" Grade B/C plywood. At wet areas only ¾" plywood is acceptable.
   3. Cabinet backs shall be Grade B/C 3/8" thick plywood.
   4. Shelves shall be adjustable.
   5. Doors and drawer fronts shall be flush overlay type.
   6. Plastic laminate on all exposed and semi-exposed surfaces, including toe kick.
      a) Color to be selected from full range of Formica, Wilsonart, or Nevamar patterned or non-patterned standard colors.

b) Use standard 0.050” thick laminate on countertops and backsplashes. Use 0.028” thick laminate or thicker on vertical surfaces. Color and pattern selected by Architect. Two colors to be used.
c) Backsplash color shall match counter top.

7. All joinery shall be glued.

B. Fabricate and install vanities and countertops in accordance with the details on the Drawings and as Specified herein:
1. Vanity tops, aprons and backsplashes, and counter and backsplash behind the altar shall be ¾” thick Industrial Grade, minimum weight 50 pounds per cubic foot, particle board or ¾” Grade B/C plywood with exterior glue. At wet areas only ¾” plywood is acceptable.
2. Vanity and counter support framing shall be ¾” and 1 ½” clear spruce or hem-fir.
3. Plastic laminate on all exposed:
a) Colors are selected herein and illustrated on the drawings.
b) Use standard 0.050” thick laminate on countertops and backsplashes. Color and pattern selected by Architect. Two colors to be used.
c) Backsplash color shall match countertop.
4. All joinery shall be glued.

C. Hardware: Cabinet hardware shall be –

1. For Each ¾” Thick Hinged Door Leaf:			
a)	1 pair Hinges	Blum	95M553
b)	Pull	Hafele	134.80.610 – Brushed Stainless
c)	Lock (if shown)	Knape & Vogt	986 x US26D
d)	Catch (inactive leaf of locked pair)	Ives	2
2. For Each Drawer:			
a)	1 set Drawer Guides	Blum	230
b)	1* Pull	Hafele	134.80.610 – Brushed Stainless
c)	1 Lock (if shown)	Knape & Vogt	986 x US26D
	*2 pulls if drawer width more than 24”		
3. Adjustable Shelves Supports in Cabinetwork:			
a)	Line bored 1”	Blum	34.0040

D. Adhesives:
1. For plastic laminates, use phenol, resorcinol, or melamine base, complying with Fed Spec MM-A-181, in type, grade, and class best suited for the intended use.

2.2 FABRICATION

A. General:
1. Fabricate and assemble units complete at the mill insofar as their dimensions will permit for transportation and proper handling.

2. For units with sectional construction:
a) Accurately fit and align the separate parts

b) Provide ample screw, glue-and-bolt blocks, drawbolts, tongues, grooves, splines, dowels, tenons, mortises, and other means of fastening to render the work of this Section substantial, rigid, and permanently secured in the proper position.

B. Scribe Members:
   1. Provide sufficient additional material to permit scribing to walls, floors, and related work.

C. Framing and Blocking:
   1. Assemble with bolted and screwed connections, securing to structural backings with cinch anchors, expansion screws, or toggle bolts as necessary.
   2. Sides, tops and bottoms nailed and glued with water resistant glue.
   3. Assemble fixtures without face nails or face screws.

D. Cut and fit the work of this Section as necessary to receive, clear, engage, or support other parts of the Work, and as needed for interface with electrical, plumbing, and other units.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION FOR INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Make necessary measurements in the field to assure proper fit of shop fabricated items.

C. Prior to start of installation, verify that the work of other trades is sufficiently complete to properly permit this installation to proceed.

3.3 INSTALLATION

A. Install the work of this Section at the locations shown on the Drawings.
   1. Scribe units to wall, floor, and other surfaces as appropriate, with not more than 1/8” clear between the cabinet or fixture and the abutting permanent surface.
   2. Set each unit square, level, and plumb.

B. Coordinate the time of installation with availability of other trades to make required utility connections.

C. Upon completion of installation, thoroughly clean each item by use of only such cleaning materials as are recommended by the manufacturer of the item being cleaned.

1 END OF SECTION

SECTION 07190
SUBGRADE VAPOR BARRIER

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 SCOPE

A. This section covers the furnishings and installation of a water-vapor barrier subgrade cover complete.

1.3 DELIVERY AND STORAGE OF MATERIALS

A. Materials shall be delivered to the project site in their original, unopened, package or container bearing a label clearly identifying manufacturer's name, brand name, material, and other pertinent information.

PART 2 – PRODUCTS

2.1 WATER VAPOR BARRIER SUBGRADE COVER

A. The subgrade cover shall be a clear polyethylene sheeting, 0.006" (6-mil) in thickness. It shall be resistant to decay when tested in accordance with ASTM E-145-68, and shall have a water-vapor permeance after exposure in the resistance to decay test not exceeding 0.5 perm when tested in accordance with ASTM E-96-66 (1972), Procedure B.

PART 3 – EXECUTION

3.1 GENERAL

A. The surface on which vapor barrier materials are to be applied shall be smooth and free from any projections which might puncture the barrier. All electrical, plumbing, and other concealed work shall be complete prior to its installation.

3.2 WATER-VAPOR BARRIERS

A. The subgrade cover shall be installed over the ground surface under interior concrete floor construction on grade. The ground surface shall be level, and free of debris, sharp objects, standing water, and any other deleterious substances before the subgrade cover is applied.

Subgrade cover sheets shall be laid over the ground surface with not less than a 6” lap at the edges and ends. Care shall be taken to prevent tears, breaks, or ruptures of any kind. Tears and breaks occurring in the membrane shall be patched. Patches shall lap edges of tears, breaks or ruptures a minimum of 12” all sides; seal all edges with tape. The tape shall be not less than 2” in width. All penetrations thru the vapor barrier shall be sealed with tape.

END OF SECTION

SECTION 07210
BUILDING INSULATION

PART 1 – GENERAL

1.1 SUMMARY

A. Provide building insulation where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 04220 – Concrete Unit Masonry
   3. Section 09110 – Metal Stud Partition Systems

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Provide the Architect the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide the following building insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.

   1. Type A: 3-1/2" thick unfaced glass fiber sound attenuating batt insulation.

a. Application: Interior or exterior walls or roofs where indicated on the Drawings or elsewhere in the project manual.
b. Manufacturer: Owens Corning, Certain Teed, Schuller or others approved in advance by the Architect.

3. Type B: 6” thick foil-faced glass fiber minimum R19.
   a. Application: Interior or exterior walls or roofs where indicated on the Drawings or elsewhere in the project manual.
   b. Manufacturer: Owens Corning, Certain Teed, Schuller or others approved in advance by the Architect.
4. Type C: 6" thick unfaced glass fiber minimum R19
   a. Application: Interior or exterior walls or roofs where indicated on the Drawings or elsewhere in the project manual.
   b. Manufacturer: Owens Corning, Certain Teed, Schuller or others approved in advance by the Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Remove, or protect against projections in construction framing which may damage or prevent proper insulation.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer’s recommended installation procedures as approved by the Architect, anchoring all components firmly into position.

END OF SECTION

SECTION 07270
FIRESTOPPING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide fire penetration and smoke seals through openings in floors, walls and other elements of construction, as specified herein, and as needed for a complete and proper installation.

B. Firestopping shall be in accordance with ASTM E–814 (ANSI/UL 1479), CAN4–S115 and ASTM E–119 (ANSI/UL 263).

C. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Coordinate work of this section with work of other sections (referenced below):
      a. Section 03300 – Concrete Work
      b. Section 04220 – Unit Masonry
      c. Section 09270 – Gypsum Wallboard System
      d. Division 15 and 16 Sections – Mechanical, Electrical and Plumbing Work

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 60 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   2. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Applicator Qualifications – Two years experience installing UL or ULC classified firestop systems or industry equivalent.

B. Performance – Materials shall have been tested to provide a fire resistance rating equal to or surpassing that required by the design document.

C. Opening dimensions that are not in keeping with the mechanical drawings will be the responsibility of the sections referenced in 1.1.C. respectively.

D. Quantified Toxicity Report – Available upon request from qualified 3rd party test facility.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings, or manufacturer's detail sheets showing each condition that requires a penetration firestop system or fire resistive joint system. These details must be in accordance with the proposed approved system. Details must include materials to be used, anchorage, methods of installation, and relationship to all adjacent construction.

B. Manufacturer's Data: Submit copies of all manufacturer's specification data, recommendations, and installation instructions for each type of material required.

1.5 SUBMITTALS

A. Deliver materials undamaged in manufacturers clearly labeled, unopened containers, identified with brand, type, grade, and qualification label where applicable.

B. Coordinate delivery and scheduled installation date to allow minimum storage time at site.

C. Store materials in clean, dry, ventilated location. Protect from soiling, abuse and moisture. Follow manufacturer's instructions.

1.6 PROJECT CONDITIONS

A. Existing Conditions: Installer shall verify that existing conditions and substrate are acceptable for the proposed application before starting work. Unsatisfactory conditions must be corrected before proceeding.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide materials by a qualified third party test facility tested in a system to provide fire resistance
equal to at least the rating of construction assembly being penetrated, or as dictated by the local Code Authority.
B. Provide asbestos free materials that comply with applicable codes and have been tested in accordance with ASTM E–814 (ANSI/UL 1479), CAN4–S115 or ASTM E–119 (ANSI/UL 263).

2.2 ACCEPTABLE MATERIALS

A. Products meeting the requirements described above as outlined in Section 4.1. The following manufacturers are approved.
AD Fire Protection Systems
1-800-650-0881
Tremco, Inc., Cleveland, Ohio
1-800-682-9160.
Tremco Ltd., Toronto Ontario

(416) 421-3300
Other equal products by qualified manufacturers approved in advance by the Architect.

PART 3 – EXECUTION

3.1 INSTALLATION PROCEDURES

A. All surfaces to be sealed must be free of dirt, dust, grease, oil, loose materials, rust or other substances that may affect the proper application of the firestopping materials.

B. Surfaces to which penetration firestop materials are applied to must meet or exceed general design requirements, and be acceptable to the manufacturers written instructions.

C. Install penetration firestop materials as outlined in the UL, cUL, ULC Fire Resistance Directory, Factory Mutual or other approved test facility's publication or in accordance with the material manufacturers written instructions.

D. Any openings in floor or wall not described in a test facility's published directory, or outlined in the manufacturer's data sheets must be firestopped in a manner that meets or exceeds code requirements for that construction.

3.2 FIELD QUALITY CONTROL

A. All penetration firestop systems should be examined by an appointed Code Official, and the General Contractor, to ensure proper installation. All systems should remain accessible until all and any inspections have been completed.

3.3 ADJUSTING AND CLEAN UP

A. Remove equipment, materials and debris, leaving the area in an undamaged and clean condition.

PART 4 – SYSTEMS

4.1 SYSTEM TYPES: Use a system listed below that best matches the wall and floor construction or refer to the manufacturers published literature.

A. Single Metal Pipe/ Conduit Penetrations
UL Designations: CAJ1029, CAJ1065, CAJ1113, CAJ1144, CAJ1179, CAJ1198, WL1051
ULC Designations: SP179, SP138, SP169, SP173, SP234, SP356
Tremco Products: Fyre-Shield, Fyre-Sil, Fyre-Sil S.L., TREMstop WBM

B. Multiple Metal Pipe/ Conduit Penetrations
UL Designations: CAJ1047, WJ1012, WL1020
ULC Designations: SP179, SP180, SP231, SP233, SP236, SP237, SP256
Tremco Products: Fyre-Shield, Fyre-Sil, Fyre-Sil S.L.

C. Insulated Metal Pipe Penetrations

UL Designations: CAJ5052, CAJ5067, CAJ5068, CAJ5071, CAJ5072, FA5003, WL5034
cUL Designations: CAJ5003C, WL5002C, WL5003C, WL5004C
ULC Designations: SP145, SP146, SP379
Tremco Products: TREMstop WS, TREMstop WBM, Fyre-Sil, Fyre-Sil S.L., Fyre-Shield

D. Combustible Plastic Pipe/ Conduit Penetrations
UL Designations: CAJ2068, CAJ5067, CAJ2069, CAJ2070, CAJ2071, CAJ2072, CAJ2073, CAJ2074, CAJ2075, CAJ2076, CAJ2080, CAJ2081, CAJ2082, CAJ2083, CAJ2084, CAJ2085, CAJ1111, CAJ2114, CAJ2115, CAJ2116, FA2024, WJ2117, WL2060, WL2061, WL2062, WL2063, WL2064, WL2065, WL2066, WL2082, WL2083
cUL Designations: WL2001C
ULC Designations: SP359, SP370, SP371, SP372, SP373, SP378, SP381
Tremco Products: TREMstop WS, TREMstop MCR, TREMstop WBM, Fyre-Can, Fyre-Can Sleeve, Fyre-Sil, TREMstop M

E. Cable Penetrations
UL Designations: CAJ3022, CAJ3036, CAJ3068, WL3017, WL3018, WL3043, WL3044, WL3050
ULC Designations: SP231, SP232, SP233
Tremco Products: TREMstop PS, TREMstop WBM, Fyre-Sil, Fyre-Shield

F. Cable Tray Penetrations
UL Designations: CAJ4007, CAJ4018, WJ4005
ULC Designations: SP139, SP361
Tremco Products: TREMstop PS, TREMstop WBM, Fyre-Sil, Fyre-Shield

G. Bus Ducts
UL Designations: CAJ6007
Tremco Products: TREMstop WS, Fyre-Sil

H. Blank Openings
UL Designations: CAJ0011, CAJ0026
ULC Designations: SP147
Tremco Products: Fyre-Shield, Fyre-Sil, Fyre-Sil S.L.

I. Fire-rated Joints
UL Designations: U900A, U900B, U900C, J900Z005, J900Z013, J900Z014
ULC Designations: JF18, JF19, JF20, JF21, JF22, JF32, JF33, JF34, JF53
Warnock Hersey Designations: TL/PV 60-01, TL/PV 20-01, PSV-0449, PSV-0450, PSV-0451,
PSV-0472, PSV-0473, PSV-0474, PSV-0475
Omega Point Laboratory: Report No. 95172.
Tremco Products: DYmeric, Fyre-Sil, Fyre-Sil S.L., THC900, TREMstop Acrylic, TREMstop WBM

J. Mixed Items:
UL Designations: CAJ8034
ULC Designations: SP376

Tremco Products: TREMstop WS, TREMstop WBM

END OF SECTION

SECTION 07920
SEALANTS AND CAULKING

PART 1 – GENERAL

1.1 SUMMARY

A. Throughout the Work, seal and caulk joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of moisture and air.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

C. Specifically included, without limiting the generality of specifications and drawings, are:
   1. Sealant at all exterior joints around windows, doors, panels, expansion joints, joints between dissimilar materials where noted on drawings.
   2. Sealant at all interior joints in finish work, joints between dissimilar materials and where noted on Drawings.
   3. Joint filler and backup materials for all sealant joints.
   4. Protection of adjacent surfaces and cleaning.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Owner the following when required:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, will become the basis for accepting or rejecting actual installation procedures used on the Work.

C. Samples: Upon request of the Architect, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Do not retain at the job site material which has exceeded the shelf life recommended by its manufacturer.

PART 2 – PRODUCTS

2.1 SEALANTS

A. For all exterior joints and all interior or exterior "working or moving" joints, shall be any one of the following generic types:
   1. One-part polyurethane sealant – Focuseal 825 as manufactured by Focuseal, Inc..
   2. Other manufacturers may be used when approved in advance by the Architect.

B. For Interior Wet Areas: One-part, mildew resistant siliconized acrylic latex – Focuseal 630, or others when approved in advance by the Architect

C. For all other Interior Joints: One-part Polyseamseal All Purpose Adhesive Caulk, manufactured by Darworth Company.

D. Sealant Colors: Colors shall be selected generally to match the adjacent surfaces.

2.2 PRIMERS

A. Use only those primers, if required, which have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used.

2.3 OTHER MATERIALS

A. Joint Fillers and Backing Material:
   1. Closed-cell, non-staining, expanded polyethylene foam. Round or square shape strips to fit joint size.
   2. Foam Joint Filler (where noted on Drawings): WILL-SEAL precompressed expanding foam sealant tape or equal. Size as shown on the Drawings. Thickness per manufacturer's recommendation for watertight seal.

B. Bond Breaker Tape: Polyethylene or other plastic tape as recommended by the sealant manufacturer, non-bonding to sealant, self-adhesive where applicable.

C. Cleaning Solvents: Oil free solvents as recommended by the sealant manufacturer. Do not use reclaimed solvents.

D. Masking Tape: Removable paper or fiber tape, self-adhesive, non-staining.

E. Provide other materials not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 GENERAL

A. Examine all joint surfaces for conditions that may be detrimental to the performance of the completed work. Do not proceed until satisfactory corrections have been made.

B. Temperature: Unless otherwise approved or recommended in writing by the sealant manufacturer, do not install sealants at temperatures below 40 degrees F or above 85 degrees F.

C. Humidity and Moisture: Do not install the work of this section under conditions that are detrimental to the application, curing, and performance of the materials.

D. Ventilation: Provide sufficient ventilation where sealants, primers, and other similar materials are installed in enclosed spaces. Follow the manufacturer's recommendations.

E. Protect all surfaces adjacent to sealants with non-staining removable tape or other approved covering to prevent soiling or staining.

F. Protect all surfaces in the work area with tarps, plastic sheets, or other approved coverings to prevent defacement from dropping.

G. Clean joint surfaces immediately before installation of sealant and other material specified in this Section.
   1. Remove all loose materials, dirt, dust, rust, oils, and other foreign matter that will impair the performance of materials installed under this Section.
   2. Remove lacquers, protective coatings, and similar materials from joint faces with manufacturer's recommended solvents.
   3. Do not limit cleaning of joint surfaces to solvent wiping. Use methods such as grinding, acid etching or other approved manufacturer's recommended means, if required, to clean the joint surfaces, assuring that the sealant material will obtain positive and permanent adhesion.

H. Set joint fillers at proper depth and position as required for installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between the ends of the joint filler units.

I. Install baker rod of sufficient size to fill the joint width at all points in a compressed state. Compress backer rod at the widest part of the joint by a minimum of 25%. Do not cut or puncture the surface skin of the rod.

3.2 INSTALLATION OF SEALANTS

A. Prior to start of installation in each joint, verify the joint type according to details on the Drawings, or as otherwise directed by the Architect, and verify that the required proportion of width of joint to depth has been secured.

B. Equipment:
   1. Apply sealant under pressure with power-actuated hand gun or manually-operated hand gun, or by other appropriate means.
   2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.

C. Thoroughly and completely mask joints where the appearance of primer or sealant on adjacent surfaces would be objectionable.

D. Install the sealant in strict accordance with the manufacturer's recommendations, thoroughly filling joints to the recommended depth.

E. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings:
   1. Provide uniformly smooth joints with slightly concave surface.
   2. Do not use tooling agent unless specifically so recommended in writing by the manufacturer of the sealant

F. Cleaning Up:
   1. Remove masking tape immediately after joints have been tooled.
   2. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.
   3. Upon completion of the work of this Section, promptly remove from the job site all debris, empty containers, and surplus material derived from this portion of the Work.

END OF SECTION

SECTION 08100
METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 SUMMARY

A. Provide metal doors, and metal door and window frames, which are not specifically described in other Sections of the Specifications, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 07920 – Sealants and Caulking
   3. Section 08210 – Flush Wood Doors
   4. Section 08710 – Finish Hardware

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Provide the Architect with the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Shop Drawings showing details of each frame type, elevations of door designs, details of openings, and details of construction, installation and anchorage.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Unless specifically otherwise approved by the Architect, provide all products of this Section from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 METAL DOORS

A. Acceptable products include those manufactured by:
   1. Steelcraft
   2. Ceco
   3. Atlantic
   4. Republic
   5. Equal products of other manufacturers approved in advance by the Architect.

B. Type and Design:
   1. Provide 1-3/4" thick full flush with visible edge seams design, fabricated from metal complying with ASTM A40, hot-dip galvanized and prime painted, with a tightly hemmed vertical seam on lock and hinge edges, with steel top flush caps on doors exterior doors and beveled lock edge, in the dimensions and types shown on the Drawings, reinforced for the finish hardware being provided under Section 08710 of these Specifications.
   2. Standard: Steelcraft
   3. Exterior steel doors:
      a) Doors shall be L-18 type.
      b) Galvanized for field painting
      c) Steel Top Caps
      d) Core shall be impregnated kraft honeycomb core.
   4. Interior Rated Door and Frame Assembly
      a) Label openings as indicated on the drawings.
      b) Doors shall be L-14 type.
      c) Core shall be impregnated Kraft honeycomb core.

C. Provide L-200 Series insert louvers where indicated on the Drawings.

D. Pre-clean and shop prime each door for finish painting which will be performed at the job site under Section 09900 of these Specifications.

2.2 METAL FRAMES

A. Acceptable products: See Paragraph 1.3.B above and 2.1.B.2

B. Type and Design:
   1. Provide frames in the dimensions and types shown on the Drawings, non-labeled or labeled as indicated on the Drawings, in 18 gauge for interior frames and 16 gauge for exterior frames, prime painted properly reinforced for the finish hardware being provided under Section 08710 of these Specifications.
   2. Prepare frames for security systems and electrical connections if indicated on the Drawings and required by the Owner.
   3. Provide all welded construction for exterior and interior installation and DW construction for interior metal stud wall applications.
   4. Exterior frames shall be galvanized.
   5. Exterior frames shall be weather stripped 3 sides with manufacturer's standard type.

6. Interior frames shall have 3 rubber silencers per latch edge.
7. One base anchor and 2 adjustable jamb anchors per side.
8. Standard: Steelcraft

2.3 FINISH HARDWARE

A. Secure templates from the finish hardware supplier, and accurately install, or make provision for all finish hardware at the factory.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Placing Frames:
   1. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.
   2. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Fill gypsum board cut-outs at anchors with veneer plaster material.

3.3 ADJUST AND CLEAN

A. Final Adjustments:
   1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection.
   2. Leave work in complete and proper operating condition.
   3. Remove defective work and replace with work complying with the specified requirements.

B. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer.

END OF SECTION

SECTION 08211
FLUSH WOOD DOORS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide flush wood doors, complete in place with finish hardware installed, where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 06200: Finish Carpentry and Millwork
   3. Section 08100: Metal Doors and Frames
   4. Section 08710: Finish Hardware

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Architect the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with:
   1. "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute, for the grade or grades specified.
   2. Certification and stamps will not be required.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Delivery:
   1. Deliver doors to the job site after plaster and cement are dry, and after the building has reached average prevailing humidity of its locality.

C. Storage:
   1. Stack flat on 2" x 4" lumber, laid 12" from ends and across center.
   2. Under bottom door and over top of stack, provide plywood or corrugated cardboard to protect door surfaces.
   3. Store doors in area where there will be no great variations in heat, dryness, and humidity.

D. Do not drag doors across one another; lift doors and carry them into position.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide flush wood doors of the types, designs, and thicknesses shown on the Door Schedule in the Drawings, labeled or non-labeled as indicated and required, and in solid core or hollow core as shown on the Door Schedule and Door Diagrams.

B. Non-Fire Label Doors:
   1. Bonded particle core interior doors with minimum of 1-1/8" solid hardwood top and bottom edge rails and minimum of 1-1/8" solid hardwood jamb edges. Door thickness 1-3/4". Sizes as scheduled.
   2. Face veneers to be primed paint grade wood veneer of any hardwood species.
   3. Manufacturer: Weyerhauser SP Particleboard Doors #DSP-1 or equivalent.
   4. Doors to be lifetime guaranteed by the Manufacturer, covering replacement and reasonable re-installation costs. Furnish a written guarantee.

C. Provide core and edge construction as needed to accommodate finish hardware described in Section 08710 of these specifications.

D. Site finish or mill finish wood doors in accordance with provisions of Section 09900 of these Specifications.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Fitting and Machining:
   1. Unless doors are completely fitted and machined at the mill, fit them for width by planing and fit them for height by sawing:
      a) Bottom: ½" clearance maximum, except fire label doors shall be 1/8" clearance maximum.
      b) Top: 1/8" clearance maximum.
      c) Lock edge and hinge edge: Bevel 1/8" in 2" maximum.

2. Machine doors for hardware in accordance with recommendations of the hardware Manufacturers.

B. Receive and retain custody of finish hardware furnished for the work of this Section under Section 08710 of these Specifications and, except as otherwise directed by the Architect, install all such finish hardware in strict accordance with the recommendations of its Manufacturer.

C. Replace or rehang doors which are hinge bound and do not swing or operate freely.

END OF SECTION

SECTION 08710
FINISH HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. Work Included:
   1. Furnish finish hardware required to complete the Work as shown on the Drawings and as specified herein.
   2. Furnish trim attachments and fastenings, specified or otherwise required, for proper and complete installation.
   3. Deliver to the job site those items of finish hardware scheduled to be installed to the job site and deliver to other points of installation those items of finish hardware scheduled to be factory installed.
   4. The intent of the hardware specification is to specify the hardware for the interior and exterior doors and to establish a type, continuity and standard of quality however, it shall be the contractor's responsibility to review the conditions, schedules, specifications, drawings and contract documents to verify the suitability of the hardware specified. The contractor shall furnish appropriate hardware for all openings whether or not scheduled.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Installation of finish hardware is described in Section 06400 – "Architectural Woodwork" of these Specifications.

C. Definitions:
   1. "Hardware groups" described in the Hardware Schedule in Part 3 of this Section are as shown on the Door Schedule.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 45 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
      a) In this regard, note that the Finish Hardware Schedule in Part 3 of this Section is firm and that substitutions will not be considered except as approved in advance by the Architect or as shown to be required because of non-availability of the specified item.
      b) Approval of this list by the Architect will not relieve the Contractor of the responsibility to provide all finish hardware items required for the Work even though such required items may not have been shown on the approved list.

C. Samples:
   1. Within 15 calendar days after being so requested by the Architect, deliver to the Architect samples of each finish hardware item requested.
   2. All samples will be returned to the Contractor. Samples which are approved by the Architect are positively identified and are installed in the Work at locations agreed to by the Architect

D. Templates - In a timely manner to assure orderly progress of the Work, deliver templates or physical samples of the approved finish hardware items to pertinent manufacturer's of interfacing items such as doors and frames.

1.3 QUALITY ASSURANCE

A. Provide the services of an AHC or DAHC member of the Door Hardware Institute to:
   1. Be available for consultation with the Owner at no additional cost to the Owner during progress of construction.
   2. Be present at completion of construction, and:
      a) Inspect installation of all finish hardware items.
      b) Make all minor adjustments required.
      c) Report to the Architect on completeness of the installation

B. The hardware consultant may be an employee of the supplier.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.

PART 2 – PRODUCTS

2.1 GENERAL

A. Fasteners:
   1. Furnish necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.
   2. Where necessary, furnish fasteners with toggle bolts, expansion shields, sex bolts, and other anchors approved by the Architect, according to the material to which the hardware is to be applied and according to the recommendations of the hardware Manufacturer.
   3. Provide fasteners that harmonize with the hardware as to finish and material.

B. Where butts are required to swing 180 degrees, furnish butts of sufficient throw to clear the trim.

C. Furnish silencers for door frames at the rate of three for each single door and two for each pair of doors, except weather-stripped doors and doors with light seals or sound seals.

2.2 KEYING

A. Factory key and masterkey locks and cylinders as directed by the Architect

B. Furnish three keys for each lock and six master keys for each set.

C. Construction Keying:
   1. Furnish a construction master key system with 10 keys for locks and cylinders.
   2. Use only the construction keys during construction.
   3. Upon Substantial Completion of the Work, as that Date is established by the Architect, void the construction key system and, in the presence of the Architect, demonstrate that the specified keying system is operating properly.

D. Identification and Delivery:
   1. Factory stamp permanent keys, “DO NOT DUPLICATE”.
   2. Identify permanent keys with tags and send direct to the Owner by registered mail or receipted personal delivery.

E. Hardware supplier shall provide two (2) lock cylinders to the exit door supplier.

F. Key Cabinet:
   1. Furnish a key cabinet complete with accessories to accommodate all keys.
   2. Manufactures: Telkee - Aristocrat or equivelent
   3. Model: AWC-150-S
   4. Prepare and furnish the Owner with complete index of keys as directed by the Architect. Tag and file all keys in cabinet location as directed by the Architect. Hardware supplier shall deliver keys, index lists, and cabinet, set-up and assembled to the jobsite.

2.3 TOOLS AND MANUALS

A. With the delivery of permanent keys, deliver to the Owner one complete set of adjustment tools and one set of maintenance manuals for locksets, latch sets, closers, and panic devices.

2.4 ACCEPTABLE PRODUCTS

A. For each of the required items of finish hardware, provide from the specified manufacturer or from one of the indicated acceptable substitutes.

ITEM	MANUFACTURER	ACCEPTABLE SUBSTITUTE
1. Butts	Hager	McKinney or Stanley
2. Locks	Schlage AL Series	Corbin/Russwin CL 3600 Series
Newport		
3. Closers	LCN	Russwin, Norton or Yale

4. Exit Devices	Von Duprin	Yale or Russwin
5. Thresholds Products	Pemko	Reese, Zero or National Guard
6. Bolts	Rockwood	H.B. Ives
7. Coordinators	Roclwood	Glynn-Johnson
8. Miscellaneous Products	Pemko	Rockwood or National Guard
9. Stops	Rockwood	Glynn-Johnson or H.B. Ives

B. Provide the finishes of all visible items in US626 (US26D) satin stainless steel unless noted otherwise on the schedule. Verify all finishes with the Architect.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 DELIVERIES

A. Stockpile items sufficiently in advance to assure their availability and make necessary deliveries in a timely secure manner to assure orderly progress of the total Work.

B. Deliver to the glass door fabricator keyed lock cylinders.

3.2 COORDINATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Upon completion of the Work, and as a condition of its acceptance, provide the inspection, adjustment, and report described in Article 1.3 above.

3.3 FINISH HARDWARE SCHEDULE

A. Furnish the following hardware sets as indicated on the drawings.

END OF SECTION

SECTION 08800
GLAZING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide glazing and glazing accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 08410 – Aluminum Entrances and Storefronts (Windows)
   3. Section 08420 – Aluminum Curtain Wall System
   4. Section 08520 – Aluminum Windows
   5. Section 08100 – Metal Doors and Frames
   6. Section 08211 – Flush Wood Doors

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Architect the following when required:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturers' specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturers' recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

C. Samples: Accompanying the above product data, submit:
   1. Samples, at least 12" x 12" of each type of glass and gasket proposed to be used.
   2. Samples, at least 12" long, of each type of sealant proposed to be used, installed between samples of the material to be glazed, fully cured.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with pertinent recommendations contained in:
   1. Flat Glass Marketing Association:
      a) "Glazing Sealing Systems Manual"
      b) "Glazing Manual"

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. During storage and handling of glass, provide cushions at edges to prevent impact damage.

PART 2 – PRODUCTS

2.1 GLASS

A. General:
1. For all glass, provide the type and thickness shown on the Drawings or specified herein.
2. Where type and thickness, or both, are not shown on the Drawings or specified herein, provide type and thickness directed by the Architect.
3. All interior glass shall be clear.

B. Plate or Float Glass:
1. Comply with ASTM C1036-85, Type I, Class 1, Quality q5
2. Where plate glass is called for, float glass may be used.

C. Tempered Glass:
1. Provide tempered or heat-strengthened as indicated on the Drawings, and elsewhere as required by governmental agencies having jurisdiction. The glass shall be clear, tempered or heat-strengthened in such a manner that the roller or tong marks, nor their effects shall not be visible in the finished work.
2. Glass for Tempering - Comply with ASTM C1048-85, Type I, Class 1, Quality q5.
3. Sizes and Cutting:
   a) Prior to tempering or heat treating, cut glass to required sizes as determined by accurate measurements of the openings to be glazed, making allowances for required edge clearances.
   b) Cut and process edges in accordance with the glass manufacturer's recommendations.
   c) Strengthen by the manufacturer's standard heat treating process, increasing flexural strength to not less than twice the strength before treatment.
   d) Do not permit warpage in excess of industry standard.
4. Provide tempered glass in all entry doors and all installations within 36" in any direction of a door opening.

D. Impact Rated Glass, Laminated Glass and Insulated Glass:
1. Laminated architectural glass consisting of 2 plys of clear annealed float glass with 0.060 tinted interlayer. Overall thickness as noted below. Minimum STC value – 39.
2. Interlayer - Monsanto "Saflex" or equivalent by others.
3. The glass shall meet minimum requirements as specified above and in ASTM C1036 or C1048.
4. The glass shall withstand the wind loads per the 2010 Florida Building Code and the pressures as indicated on the drawings.
5. Locations: Aluminum entrance doors, and windows.
6. Manufacturer: Viracon; Ft. Myers (239) 768-5349

a) 9/16” Laminated Large Missile Impact Rated Glass, “Stormguard”. Type, VLE-70 #2 with ¼” clear float.

E. Fire Rated Glass
1. All glass in fire rated doors, frames, sidelights or other rated assemblies shall be rated and sized to conform with the applicable code requirements.
2. The glass shall meet the requirements of FBC 707.6 and may be wired glass or special performance non-wired fire safety glass as specified separately in this project manual. Contractors option with code compliance as an override.
3. All fire glass installation shall be complete with steel stops and glazing compounds in compliance with regulatory requirements.

F. Glazing sealants:
1. All glass shall be installed with non-hardening sealants, tapes or gaskets that are essentially 100% solid systems compatible with the laminate as recommended by the laminate manufacturer

G. Mirrors:
1. Unframed mirrors shall consist of clear ¼” thick polished or float glass.
2. Glass shall be highly reflective with true image reflection with virtually no distortion.
3. Grind edges smooth and ease edges to a slight radius.
4. Secure with glue. Glue shall be mirror and Insulation glue manufactured by Focuseal, Inc. Apply the adhesive on either surface with a trowel. Gently press both surfaces together, then separate. Let the adhesive set up 5-10 minutes then press together for a secure bond.
5. Provide along the bottom edge a silvered plastic moulding.
6. Clean the glass.
7. Manufacturer: Guardian Industries Corporation, Virginia Glass Products Corporation or equal by others approved in advance by the Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Clean glazing channels, stops, and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the work.
1. Remove protective coatings which might fail in adhesion or interfere with bond of sealants.
2. Comply with Manufacturers’ instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.

3. Prime surfaces to receive glazing compounds in accordance with Manufacturers' recommendations.

3.2 INSTALLATION

A. Inspect each piece of glass immediately prior to start of installation
   1. Do not install items which are improperly sized, have damaged edges, or are scratched, abraded, or damaged in any other manner.
   2. Do not remove labels from glass until so directed by the Architect.
   3. Install glass so distortion waves, if present, run in the horizontal direction.

B. Locate setting blocks at sills one quarter of the width of the glass in from each end of the glass, unless otherwise recommended by the glass Manufacturer.
   1. Use blocks of proper size to support the glass in accordance with the Manufacturer's recommendations.

   2. Provide spacers for all glass sizes larger than 50 united inches, to separate glass from stops, except where continuous glazing gaskets or felts are provided.
      a) Locate spacers no more than 24" apart and no closer than 12" to a corner.
      b) Place spacers opposite one another.
      c) Make bite of spacer on glass ¼" or more.

C. Set glass in a manner which produces the greatest possible degree of uniformity in appearance.

D. Do not use two different glazing materials in the same joint system.

E. Mask, or otherwise protect, surfaces adjacent to installation of sealants.

F. Miter-cut and seal the joints of glazing gaskets in accordance with the manufacturer's recommendations, to provide watertight and airtight seal at corners and other locations where joints are required. Water shall not be allowed to collect in the glazing channel. Weep holes shall be provided.

G. Glazing tolerances shall be the following minimums:
   1. Edge clearance 5/16" and Bite 7/16". These minimums may be required to be increased due to design requirements for wind and debris loads.

3.3 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons or other items directly to the glass except as specifically directed by the Owner.

END OF SECTION

SECTION 08817

FIRE-RATED GLASS – PYROSTOP

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-rated glazing materials installed as vision lights in fire-rated doors.
2. Fire-rated glazing materials installed as [sidelites] [transoms] [borrowed lites] in fire-rated frames and [wall applications].

B. Related Sections:

1. Section 08110 – Steel Doors and Frames: Vision panels in interior doors and interior vision panel (borrowed lites) frames.
2. Section 08161 – Sliding Metal Doors.
3. Section 08210 – Wood Doors: Vision panels in interior doors.
4. Section 08510 – Steel Windows.
5. [Section 09260 – Gypsum Board Assemblies: Gypsum board and metal stud framed area separation partition walls.]

1.2 REFERENCES

A. ASTM E 119 –Fire Tests of Building Construction and Materials.

B. FGMA GM – Glazing Manual.

C. FGMA SM – Sealant Manual.

D. NFPA 80 – Fire Doors and Windows.

E. UL 263 – Fire Resistance Ratings.

F. 1997 Uniform Building Code.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-rated, clear and wireless glazing material for use in locations such as doors, sidelites, transoms, borrowed lites, and wall applications with fire rating requirements ranging from 20 minutes to 2 hours with hose stream test; for use in interior and exterior applications.

B. Provides protection by reducing the radiant and conductive heat transfer

1.4 SUBMITTALS

A. Comply with requirements of Section 01340.

B. Product data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.

C. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

D. Product Test Listings: From a qualified testing agency indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

E. Samples: Submit, for verification purposes, approx. 6" x 6" square sample for each type of glass indicated.

1.5 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Resistance Rated Glass: Each lite shall bear permanent, nonremovable label of UL certifying it for use in tested and rated fire resistive assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials under provisions of Section 01600.

B. Deliver materials to specified destination in manufacturer's or distributor's packaging, undamaged, complete with installation instructions.

C. Do not expose Pyrostop to temperatures greater than 120 degrees F during storage and transportation.

D. Store off ground, under cover, protected from weather and construction activities.

E. Do not expose the non-PVB side of glass to UV light.

1.7 WARRANTY

A. Provide manufacturer's limited warranty under provision of section 01740.

B. Warranty period: Five years from date of shipment by manufacturer.

PART 2 PRODUCTS

2.1 FIRE-RATED GLAZING MATERIALS

A. Manufacturer: Pyrostop as manufactured by the Pilkington Group and distributed by Technical Glass Products, Kirkland, Washington, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, web site www.fireglass.com.

B. Properties:

1. Thickness: For Interior Use 3/4", #45-200
2. Weight: Varies with thickness (approximate range 9 to 22 lbs./sq. ft.).
3. Approximate Visible Transmission: Varies with thickness (approximate range 88 to 75 percent).
4. Fire-rating: up to 0.75 hours - 45 minutes.
5. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

C. Labeling: Each piece of Pyrostop shall be permanently labeled with the appropriate marking.

D. Fire Rating: Fire rating listed and labeled by UL and/or WHI for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E 119 and UL 263.

2.2 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent, designed for compression of 25 percent to effect an air and vapor seal..

B. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:

1. Dow Corning 795 - Dow Corning Corp.
2. Silglaze-II 2800 - General Electric Co.
3. Spectrem 2 - Tremco Inc.

C. Setting Blocks: Hardwood, glass width by 4 inches by 3/16 inch thick.

D. Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.3 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

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

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION (GLAZING)

A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

D. Place hardwood setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

E. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

F. Place glazing tape on free perimeter of glazing in same manner described above.

G. Do not remove protective edge tape.

H. Install removable stop and secure without displacement of tape.

I. Do not pressure glaze.

J. Glaze exterior openings with PVB layer toward the exterior of the building.

K. Knife trim protruding tape.

L. Apply cap bead of silicone sealant along void between the stop and the glazing, to uniform line, with bevel to form watershed away from glass. Tool or wipe sealant surface smooth.

M. Provide minimum 3/16 inch edge clearance.

N. Install in vision panels in fire-rated doors to requirements of NFPA 80.

O. Install so that appropriate UL & Pyrostop markings remain permanently visible.

3.3 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

SECTION 09110
METAL STUD SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Provide interior metal stud partitions, walls and accessories as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 09260 - Gypsum Wallboard System
   3. Section 07210 - Building Insulation

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data:
   1. Materials List of items proposed to be provided under this Section.
   2. Manufacturers' specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturers' recommended installation procedures which, when approved by the Owner, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 METAL STUDS AND ACCESSORIES

A. Meet or exceed minimum requirements of Fed Spec QQ-S-698 and Fed Spec QQ-S-775d, Class d, for the item and use intended.

B. Metal Studs:
   1. At interior metal stud partitions, unless otherwise shown on the Drawings, provide standard punched steel studs of the gauges shown on the Drawings, or if not shown, utilize minimum 20 gauge studs, either hot-dip galvanized or factory pre-painted.
   2. Use only one type throughout the Work, unless otherwise shown on the Drawings or specifically approved in advance by the Architect.
   3. At masonry walls to receive gypsum wall board finish install 26 gauge hot-dipped galvanized steel "2" furring 2" in depth vertically at 16" o.c. or 1-5/8" metal stud framing.
   4. See Drawings for additional information.

C. Resilient Channels: Provide RC-1 corrosion-resistant channels where indicated on the Drawings.

D. Accessories: Provide all accessories including, but not necessarily limited to, tracks, clips, anchors, fastening devices, and resilient channels, and other accessories required for a complete and proper installation, and as recommended by the Manufacturer of the steel studs used.

E. Manufacturer: United States Gypsum Company, Gold Bond Gypsum Wallboard Products.

2.2 GROUT

A. Provide a good grade of commercial grout for leveling the floor runner member of steel stud partitions as required.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Accurately layout partition and wall lines from the dimensions shown on the Drawings.

B. Install metal studs and accessories in strict accordance with the Manufacturer's recommendations as approved by the Owner, anchoring all components firmly into position.

C. Align partition and wall assemblies to a tolerance of one in 200 horizontally and one in 500 vertically.

D. Coordination:
   1. Space the studs as required for compliance with pertinent regulations, to give proper support for the covering material, and as indicated on the Drawings.
   2. Coordinate and provide required backing and other support for items to be mounted on the finished covering.

3. Coordinate requirements for pipes, ducts and other items designed to be housed within and/or through the partition and wall systems.

3.3 LEVELING

A. By use of the specified grout, or by other means approved, provide continuous solid bearing under floor runner members of steel stud partitions and walls.

B. Level in a manner to provide uniform interface with ceilings and other overhead construction.

3.4 SOUND ATTENUATING PARTITIONS

A. Install resilient furring channels to the framing members 16” o.c. perpendicular to the framing members on one side of the wall. Gypsum wallboard is attached to the resilient channels with power driven, Type S drywall screw and spaced 12” o.c. A 3” wide strip of ½” gypsum wallboard should be used at the floor line to assure a solid base for attaching the wallboard and the base if any. An additional strip of wallboard or a resilient furring channel shall be used at the ceiling line. The point of intersection between the wall and floor shall be caulked. Install the work in strict accordance with the Manufacturer’s recommendations and instructions.

END OF SECTION

SECTION 09221
PORTLAND CEMENT PLASTER (STUCCO)

PART 1 – GENERAL

1.1 SUMMARY

A. Provide portland cement plaster where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Portland Cement:
   1. Comply with ASTM C150, Type I or II and ASTM C91.
   2. When specifically approved in advance, other cements such as masonry cement, plastic cement, and gun cement may be used in the proportions shown in the approved mix designs.
   3. No material with more than 10% lime shall be used.

B. Lime:
   1. Provide special finishing hydrated lime complying with ASTM C206, Type “S”, or provide normal finishing hydrated lime complying with ASTM C6, Type “N” with maximum unhydrated oxide content of 8% by weight, according to the proportions shown in the approved mix designs.
   2. Lime content shall be no more than 10% of mix.

C. Aggregates:
   1. Comply with ASTM C144.
   2. Use sand from mines of Standard Sand and Silica at Davenport, Florida.
   3. Fineness Modulus – 2.0 to 3.0.
   4. Keep the sand supply covered when not in use to maintain a uniform moisture content.

D. Water:
   1. Use water which is potable and free from impurities that affect setting of portland cement plaster.

E. Bonding Agents:
   1. Provide material producing a permanent bond not affected by heat, acid, alkali, or dampness, producing no discoloration to finished plaster surfaces, and complying with ASTM C631.

F. Metal Lath:
   1. Metal lath shall be galvanized steel diamond expanded mesh 2.5 lb. per sq. yd. applied over sheathing and 3.8" expanded rib lath 3.4 lb. per sq. yd. applied at all other locations.
   2. Metal lath applied over sheathing shall be backed by water tight felt backing and be of the self-furring type. Felt upper layer to lap over outside of lower felt layer and under the lath.
   3. Fasten with corrosion resistant screws by. Maximum fastener spacing 12" apart secured to wood framing.
   4. Provide standard "V" design PVC crack control joints on soffits and walls divided up in equal symmetrical areas with no area exceeding 10 lineal feet in any direction, except where noted otherwise. See Drawings. Remove plaster from groove.
   5. Provide PVC corner beads on all exterior corners and casing beads where plaster abuts other materials except at steel door frames.

G. Control Joints:
   1. Provide "V" design PVC control joints No. 2058 where accent trim diagonal pattern is shown on the Drawings.

H. Soffit Vents: Continuous 3" wide one piece vinyl soffit vents with reinforcing rib to key into stucco. Provide "vent clips" to connect sections of vent. Vent area: 15 square inches.

I. Provide and other materials, trim, and accessories, not specifically described but required for a complete proper installation, as selected by the Contractor and approved by the Architect.

J. PVC trim as manufactured by Plastic Components , Vinyl Corporation, or equal by others when approved in advance by the Architect.

2.2 MIXES

A. Procedures:

1. Proportion and measure the materials for each batch of plaster accurately.
2. Prepare batches in quantity for complete use within a maximum of one hour after mixing.
3. Do not retemper or use partially set plaster, except plaster which has stiffened only from evaporation.
4. Do not use caked, or lumpy material, but remove such material from the job site immediately.
5. Use sand which is clean, moist, and loose. Remove all particles of visible iron or other impurities.

B. Mechanical Mixing:
1. Mix each batch separately.
2. Clean the mixer thoroughly between batches, removing set or hardened materials prior to loading new materials.
3. Continue operation of mixer while adding materials.

C. Mix Proportions:
1. Shall strictly comply with manufacturer's recommendations and limits.
2. Shovel batching shall not be permitted.
3. Utilize devices as necessary to produce uniform proportions.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that grounds have been set in manner to achieve the required plaster thicknesses and in straight lines true and plumb.

3.2 TRIM

A. Provide vinyl corner bead at all exterior corners.

B. Provide vinyl casing trim wherever stucco abuts dissimilar materials except steel door frames and other cement based products, unless noted otherwise on the Drawings.

3.3 PREPARATION

A. Uniformly dampen absorptive bases by use of a fine fog spray of clean water.

B. Where required, apply the approved bonding agent.

3.4 APPLICATION

A. General:

1. Schedule application of plaster to precede application of other finishes, and installation of other items, which could be damaged by accidents incidental to the plastering.
2. Apply portland cement plaster by machine or by hand.
3. Apply each coat continuously, interrupting only at control joints, at openings, or at junctions of plaster planes.
4. Where frames or other items provide a plaster ground, tool through the finish coat to produce a V-joint at the intersection of plaster and such items.

5. Produce the total plaster thickness of 7/8” on metal lath, and 3/4” on concrete and masonry surfaces, unless noted otherwise on the Drawings.
6. Apply a bonding agent to concrete and sand face concrete block

B. Base Coats:
   1. Over metal base –
      a) Apply with sufficient material and force to cover the substrate and to form good keys, embedding and filling all spaces of the metal lath.
      b) Score to receive the succeeding coat.
   2. Over solid base –
      a) Apply with sufficient material and force to insure tight contact and complete coverage of substrate.
      b) Score to receive the succeeding coat.
   3. Three-coat installation (over metal lath) –
      a) Do not apply the second coat sooner than 48 hours after installation of the base coat.
      b) Apply with sufficient material and force to cover the substrate and form a good bond.
      c) Bring out to grounds, straighten to a true surface.

C. Finish:
   1. Machine Applied Spray Finishes –
      a) Apply initial coat by hand and float to uniform textured surface to provide a background.
      b) Finish coat shall be a uniform spray pebble pattern to produce a texture approved by the Architect.
   2. Hand Applied Finishes –
      a) Soffits, raised banding, and wall behind false windows to receive a smooth finish.
      b) Apply with sufficient material and force to cover the substrate and form a good bond.
      c) Finish to a true and even surface after moisture has left the surface.
      d) Finish surfaces to be free from imperfections visible to the unaided eye from a distance of five feet.
   3. Score the stucco at door frames to receive a sealant.
   4. See Drawings for other locations of above finishes.
   5. Provide a 10 sq. ft. sample for Architect’s approval.

3.5 TOUCHUP

A. Upon completion of the other work of this Section, inspect all portland cement plaster surfaces and correct conditions which do not meet specified requirements.

B. Remove protective materials and plaster materials from adjacent surfaces, and remove stains which would adversely affect finishes.

C. The finished work shall be cured for 28 days prior to painting. Less than 28 days cure MAY be allowed in the event ph level testing is conducted and deemed acceptable by the Architect and the specified paint manufacturers.

END OF SECTION

SECTION 09270
GYPSUM WALLBOARD SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Provide gypsum drywall and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 09110 – Metal Stud System

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Architect the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Gypsum Wallboard:
   1. Provide 5/8" gypsum tapered edge wallboard of the type manufactured for joint tape finish in 48" widths and in such lengths as will result in a minimum of joints.
   2. Provide 1 hour rated corridor walls where required and as indicated on the Drawings.

3. Manufacturer - National Gypsum Company, G-P Gypsum Corporation, Gold Bond, or other manufacturers approved in advance by the Architect.

B. Metal Trim:
   1. Casing Beads - Provide galvanized veneer L trim casing beads
   2. Corner Beads - Provide galvanized expanded veneer corner beads.

C. Jointing System:
   1. Tape – Fiberglass drywall tape.
   2. Fastening Devices:
      a) For fastening gypsum wallboard in place on metal studs and metal channels, use Type S screws, specially designed for use with power-driven tools, not less than 1" long, with self-tapping threads and self-drilling points.
      b) For fastening gypsum wallboard in place on wood, use 1-1/4" type W bugle-head screws.

D. Finishes:
   1. Provide finishes listed in locations as identified herein and on the Drawings.
      a) Finish for interior walls shall be smooth.
      b) Joint compound – Ready-mixed non-asbestos, vinyl-based formulations special premixed to a creamy, smooth consistency. Meet ASTM C475.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Install the gypsum wallboard in accordance with the Drawings and with the separate boards in moderate contact but not forced in place.
   2. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
   3. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
   4. Install all work in strict accordance with the manufacturer's recommendations and instructions.

B. Ceilings:

1. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
2. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16” on centers when attachment members are provided at end joints.

C. Walls:
1. Install the gypsum wallboard to studs at right angles to the furring or framing members.
2. Make end joints, where required, over framing or furring members.

D. Attaching:
1. Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12” on center at ceilings and 16” on centers at walls.
2. Where framing members are spaced 24” apart on walls, space screws 12” on centers.

3.3 JOINT TREATMENT

A. General:
1. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.

B. Joint Mesh Installation:
1. Center tape over all joints and interior angles and fasten with ¼” or 5/16” staples, self-adhesive tape may be used.
2. Position staples a maximum of 24” apart as follows:
   a) Joints: At alternate edges for the run from end to end and directly opposite one another at either end.
   b) Angles: Along ceiling edge only for wall-to-ceiling angles. Along one edge for wall-to-wall angles.
3. After the first staples are placed at the end of a joint or angle, pull unstapled mesh as stapling proceeds to assure that it secures to wallboard.
4. Center and apply fiberglass drywall tape directly over joint, pressing tape firmly so that it adheres evenly to surface. To eliminate wrinkles and ensure maximum bond, press entire length of tape with drywall knife. Avoid overlapping tape at intersections. Cut tape with drywall knife.
5. Cover with layer of sheetrock setting-type or lightweight setting-type joint compound, forcing compound through the tape with a drywall knife/trowel to completely fill and level the joint.
6. Apply second coat of sheetrock setting-type or lightweight setting-type joint compound, or sheetrock setting-type joint compound, feathering approximately 2” beyond first coat. Let dry and sand lightly as required.

C. Finishing Fasteners:
1. Apply a setting-type or all-purpose or lightweight all-purpose compound to fastener depressions as the first coat. Follow with a minimum of two additional coats of toping or all-purpose compound, leaving all depressions level with the surface. (Exception: Setting-type and lightweight all-purpose joint compounds need only one additional coat.)

3.4 OTHER METAL TRIM

A. General:
   1. The Drawings do not purport to show all locations and requirements for metal trim.
   2. Carefully study the Drawings and the installation, and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in the Work.

3.5 CLEANING UP

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and compounds onto floor surfaces.

B. At completion of each segment of installation in a room or space, promptly pick up and remove any droppings and leave room clean.

END OF SECTION

SECTION 09310
CERAMIC AND QUARRY TILE

PART 1 – GENERAL

1.1 SUMMARY

A. Provide tile and marble where called for on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Tile floors, walls and base
   2. Marble thresholds, vanity countertops, backsplashes, apron and window stools.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section

B. Product Data: Submit to the Owner the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements for:
      a) Ceramic tile and marble
      b) Quarry tile
      c) Sealants
      d) Grout
      e) Fasteners
      f) Adhesives

C. Samples: Accompanying the above submittal, provide samples of:
   1. Ceramic and Quarry Tile:
      a) Sufficient Samples of each size, color, and texture to demonstrate the maximum range of sizes, colors, textures, and flatness.
      b) Tiles delivered to the job or installed in the Work, and which do not fall within the accepted range, shall be removed from the site and be replaced promptly with acceptable materials.
   2. Trim Shapes and Base: Each color, type and shape.
   3. Marble Thresholds: 2 each 12" length of the specified material, shape, and finish.
   4. Marble Window Stools: 2 each 12" length of the specified material, shape and finish

D. Certificates –
   1. Accompanying the above submittal, submit:

a) Manufacturer's certification that grout materials being provided are suitable for the intended use, meet or exceed the referenced ANSI standards, and are listed on the "Tested Materials" list published by the Ceramic Tile Institute.

b) Friction test reports for floor tile.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Applicable Standards: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this Specification to the extent they are specified herein. Unless otherwise specified, use the latest edition.
   1. American National Standards Institute (ANSI)
      a) A108.1, "Installation of Ceramic Tile with Portland Cement Mortar".
      b) A108.4, "Installation of Ceramic Tile with Water Resistant Organic Adhesives"
      c) A108.5, "Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar"
      d) A108.10, "Standard Specification for Installation of Grout in Ceramic Tile Installations"
      e) A118.6, "Standard Specification for Ceramic Tile Grouts"
      f) A136, "Organic Adhesives for Installation of Ceramic Tile"
      g) A137.1, "American National Standard Specification for Ceramic Tile"
   2. Ceramic Tile Institute:
      a) "Standards of the Tile Trade"

C. Acceptable Products: Except as may be specified otherwise, use only such products as have been tested and listed by the Ceramic Tile Institute in its "Tested Materials" list.

D. Pre-tiling Meeting –
   1. Prior to commencing the work of this Section, schedule and attend a meeting at the jobsite to discuss conformance with requirements of the Contract Documents.
   2. Request attendance of representatives from:
      a) Owner
      b) Contractor
      c) Tile Subcontractor
      d) Other parties who are involved

E. Blending -
   1. Require the tile manufacturer to blend tiles at the factory.
   2. Provide additional blending at the job site as needed to secure the Architect's approval.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Provide only tile cartons which have been grade-sealed by the manufacturer in accordance with ANSI A137.1, and with grade-seals unbroken.

C. On manufactured grouts, provide labels certifying compliance with the referenced standards.

D. Wax:
   1. Wax may be applied to the face of units either by the manufacturer or the installer.
   2. After such coating has been applied, handle and store in a manner keeping wax off sides and backs of units.
   3. Units may be stacked, after waxing, back-to-back or face-to-face, but never waxed surface to unwaxed surface.

1.5 SITE CONDITIONS

A. Install mortar, and set and grout the tile, only when temperature is at least 50 degrees F and rising.

B. Protection:
   1. Protect adjacent surfaces during progress of the work of this Section
   2. Close rooms and spaces to traffic of all types until mortar and grout have set for 72 hours.

C. Shade the work area from direct sunlight during the installation as needed to prevent rapid evaporation caused by excessive heat.

D. Observe the manufacturer's recommended safety precautions, including those pertaining to ventilation.

E. Illuminate the work area during installation, providing the same level and angle of illumination as will be available for final inspection.

1.6 MAINTENANCE

A. Upon completion of the work of this Section, deliver to the Owner additional tile and trim shapes of each type, color, pattern, and size used in the Work, for the Owner's use in replacement and maintenance, at the minimum rate of 3% of the amount used in the Work, packaged securely to prevent damage, and clearly labeled.

PART 2 – PRODUCTS

2.1 CERAMIC AND QUARRY TILE

A. Provide floor tiles with coefficient of friction of 0.60 or higher in accordance with pertinent provision of ASTM C1028.

B. Provide the following where called for on the Drawings:
   1. Ceramic mosaic tile, unglazed floor tile with all specials:
      a) Vendor/Manufacturer: Dal-Tile.

b) Type: Unglazed ceramic mosaic, Keystones
c) Color: As selected by the Architect.
d) Size: 2” x 2” (Ceramic)
e) Price Group: 1, 2, 3 or 4 full range.

2. Ceramic mosaic tile, glazed wall tile with all specials:
a) Vendor/Manufacturer: Dal-Tile.
b) Type: Glazed ceramic mosaic, Keystones
c) Color: As selected by the Architect
d) Size: 4” x 4” (Ceramic)
e) Price Group: 1, 2, 3 or 4 full range.

3. Grout for ALL Tile
a) Vendor/Manufacturer: Bonsal
b) Type: unsanded
c) Color: As selected by the Architect
d) Type: Polymer modified
e) Price Group: 1, 2, 3 or 4 full range.

C. Base tiles shall match the floor tile in color and finish. The mosaic tile base is to consist of 3 courses: cove, regular and bullnose 2” x 2” units. Outside corners shall be outside cove tile and bullnose edge. Grout joints are to be aligned with floor tile.

D. Provide standard trim shapes as required.
1. Provide all bases, caps, stops, returns, trimmers, and other shapes indicated or required to produce a completely finished installation.
2. Except as may be shown otherwise on the Drawings, provide color and finish matching the adjacent tile.

2.2 THRESHOLDS AND WINDOW STOOLS

A. Provide marble thresholds and window stools in white-gray color.

B. Shape thresholds to provide a comfortable transition between tile and other floor finishes, with smooth matte surface finish.

C. Provide ½” window stools with ½” finished projection at all windows.

2.3 INSTALLATION MATERIALS

A. Expansion/control joint sealant: Provide in colors matching selected grout color.
1. At joints between floors and walls, at perimeter of metal door frames, provide one-part silicone material.
2. At joints in traffic areas, and at perimeter joints, provide two-part polyurethane material with Shore A hardness of 35.

2.4 BONDING MORTARS

A. Organic Adhesive –

1. Provide a prepared organic material, ready to use with no further addition of liquid or powder, which cures or sets by evaporation.
2. Comply with ANSI A136.1, using type I where exposed to prolonged water presence and using type II at all other locations.

B. Special tile setting mortars will be considered by the Architect when complete technical data is submitted in advance.

2.5 GROUT

A. Provide grout in colors selected by the Architect from standard colors available from the approved manufacturers.

2.6 OTHER MATERIALS

A. Provide and install anti-fracture mat under all tile installations.
B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Coordinate with other trades as needed to assure that proper substrata are provided to receive the work of this Section.

C. Where a portland cement mortar setting bed will be installed, do not commence installation of the setting bed until substrata are within the following tolerances:
1. Horizontal Surfaces: Level within ¼" in ten ft. in all directions.
2. Vertical Surfaces: Plumb within ¼" in eight ft, in all directions.

D. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
1. Horizontal Surfaces: Level within 1/8" in ten ft. in all directions.
2. Vertical Surfaces: Plumb within 1/8" in eight ft, in all directions.

E. Condition of surfaces to receive tile:
1. Verify that surfaces to receive mortar setting bed and tile are firm, dry, clean, and free from oily or waxy films and curing compounds.
2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of mortar bed or tile.

3.2 INSTALLING TILE

A. General –
   1. Comply with pertinent provisions of the referenced standards.
   2. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.
   3. Do not install tile floors over membrane until the membrane has been tested and accepted.
   4. Mix and use proprietary materials in strict accordance with the manufacturer's printed instructions.
   5. Prepare the surfaces, set, fit, grout, and clean the work of this Section in strict accordance with the referenced standards and the manufacturers' recommendations.

B. Install in accordance with pertinent provisions of the standards listed under "Quality Assurance: in Part One of this Section, pressing and beating tile into place to obtain 100% coverage by mortar on the back of each tile. Back-butter the tiles if necessary to achieve 100% coverage.

C. Limits of tile:
   1. Extend tile into recesses and under equipment and fixtures to form complete covering without interruptions.
   2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

D. Joining Pattern:
   1. Lay tile in grid pattern unless otherwise indicated on the Drawings or directed by the Owner.
   2. Align joints when adjoining tiles on floor, base, trim, and walls are the same size.
   3. Layout tile work, and center the tile fields both directions in each space or on each wall area such that no tile unit is less than ½ tile unit.
   4. Adjust to minimize tile cutting.
   5. Provide uniform joint widths of 1/8" at tile types 1 and 2.

E. Allowable variations in finished work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes, and alignments shown:
   1. Horizontal Surfaces: 1/8" in ten ft. in all directions.
   2. Vertical Surfaces: 1/8" in eight ft. in all directions.
   3. Slope tile uniformly to floor drains.

3.3 THRESHOLDS

A. Marble Thresholds -
   1. Install thresholds at openings where tile floor abuts other flooring material at same level.

3.4 GROUTING

A. General –
   1. Do not begin grouting floor tiles until they are firmly set and, in no case, in less than 48 hours after they have been installed.

2. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
3. When using proprietary grout, adhere strictly to the manufacturer's directions unless otherwise specified or approved in advance by the Architect.

B. Installation -
1. Mix grout by hand or with a slow-speed drill motor not exceeding 300 rpm, achieving a stiff non-slumping consistency, and using the minimum amount of liquid to achieve a workable mix.
2. Force the maximum amount of the approved grout into joints in accordance with pertinent recommendations contained in ANSI A108.10.
3. Fill the joints of cushion-edge tile to depth of the cushion. Fill joints of square-edge tile flush with the surface.
4. Fill all gaps and skips.
   a) Do not permit mortar or mounting mesh to show through grouted joints.
   b) Provide hard finished grout which is uniform in color, smooth, and without voids, pin holes, or low spots.
   c) Leave tile clean.

3.5 CLEANING AND POLISHING

A. After completion of setting and grouting, thoroughly clean and polish the tile.
1. Do not use acid or acid cleaners to clean tile.
2. When the tile is thoroughly clean and dry, polish glazed tile with clean dry cloths.

3.6 REPLACEMENT

A. Replace cracked, chipped, broken, and otherwise defective tiles.

B. Remove work not complying with requirements of the Contract Documents or the referenced standards, and promptly replace with work which does comply.

END OF SECTION

SECTION 09510
ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide acoustical ceilings where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Owner the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Shop Drawings in sufficient detail to show suspension, layout, lateral restraint, installation, anchorage, and interface of the Work of this Section with the Work of adjacent trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.
   5. Two each samples of each type of ceiling tile and suspension system.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 MAINTENANCE

A. Deliver to the Owner for his use in future modifications, an extra stock of approximately 10% of each type of acoustical material installed, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

PART 2 – PRODUCTS

2.1 "T" GRID SYSTEM

A. Provide a complete system of supporting members, anchors, wall cornices, adapters for light fixtures and grilles, and accessories of every type required for a complete suspended "T" grid system of the arrangements shown on the Drawings, in Natural Aluminum (NA) of the approved manufacturer, and complying with pertinent requirements of Underwriters Laboratories, Inc., and the governmental agencies having jurisdiction.

B. Acceptable Products:
   1. USG Interiors, Donn "DX" 15/16".
   2. Equal products of other manufacturers may be used.

2.2 SUSPENDED ACOUSTICAL CEILING PANELS

A. Acceptable Products:
   1. Manufactured by USG Interiors.
      a) All spaces with suspended acoustical ceiling panels – Ceiling system shall be "Radar High NRC with SLT edge. Tile size shall be 24" x 24" x 3/4".
   2. Equal products of other manufacturers may be used when approved in advance by the Architect.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION, GENERAL

A. Except as modified by requirements of governmental agencies having jurisdiction, install in accordance with recommendations of the manufacturer and with ASTM C636.

B. Lateral Bracing –
   1. Provide proper lateral bracing and as required by pertinent codes and regulations.
   2. Secure lateral bracing to structural members. Secure at right angles to the direction of the partition and four ways in large ceiling areas.

C. Provide hold-down clips for ceiling boards only when so required by governmental agencies having jurisdiction.

D. Make all grid level and in even plane at sloped ceilings within a tolerance of one in 1000 and straight within a tolerance of one in 1000.

3.3 INSTALLATION OF ACOUSTICAL MATERIALS

A. "T" grid system: Install acoustical ceiling boards so linearity of facing is as directed by the Architect.

B. See Reflected Ceiling Plans on the Drawings.

3.4 CLEANING UP

A. In addition to other stipulated requirements for cleaning, completely remove finger prints and traces of soil from the surfaces of grid and acoustical materials, using only those cleaning materials recommended for the purpose by the manufacturer of the material being cleaned.

END OF SECTION

SECTION 09660
RESILIENT TILE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Provide resilient tile flooring where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Samples of each item, color, and pattern available in the specified grades from the proposed manufacturers.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 MAINTENANCE

A. Deliver to the Owner for his use in future modifications an extra stock of two (2) unopened cases of each color and pattern in each material installed under this Section, packaging each type of material separately, distinctly marked, and adequately protected against deterioration.

PART 2 – PRODUCTS

2.1 MATERIALS – GENERAL

A. Provide colors and patterns as selected by the Architect from standard colors and patterns of the approved manufacturer in the specified type. There shall be a minimum of two colors and the layouts shall be patterned or boarders as designed at a later date by the architect.

B. Adhesives:
   1. Provide waterproof and stabilized asbestos free type adhesive as recommended by the manufacturer of the material being installed.
   2. Asphalt emulsions and other non-waterproof adhesives will not be acceptable.

C. Concrete Slab Primer:
   1. Provide non-staining type as required and as recommended by the manufacturer of the material being installed.

2.2 RESILIENT MATERIALS

A. Vinyl Composition Tile:
   1. Dimension - Provide 12” x 12” x 1/8”
   2. Acceptable Products:
      a) Azrock Industrial, Inc.
      b) Equal products of other manufacturers when approved in advance by the Architect.
   3. Colors: As selected by the Architect.

B. Rubber Base:
   1. Dimension - Provide 4” (10.16cm) topset cove wall base.
   2. Acceptable Products:
      a) Johnsonite Dura-Cove Rubber Wall Base.
      b) Roppe or Kentile, Cove Rubber Wall Base.
      c) Equal products of other manufacturers when approved in advance by the Architect.
   3. Colors: As selected by the Architect.

2.3 OTHER MATERIALS

A. Outside corners **shall be premolded** seamless and fully adhered.
B. Provide other materials, not specifically described but required for a complete and proper installation, including but not limited to trim and reducer strips, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Subfloors:
   1. Verify that substrate is smooth, level, at required finish elevation, and without more than 1/8” in 10’-0” variation from level or slopes shown on the Drawings.
   2. Prior to laying materials, broom clean or vacuum the surfaces to be covered, and inspect the subfloors.

B. Priming:
   1. Apply concrete slab primer if so recommended by the resilient flooring manufacturer.
   2. Apply in accordance with the manufacturer's recommendations as approved by the Architect.

3.3 INSTALLATION

A. General:
   1. Install materials only after finishing operations, including painting, have been completed and after permanent heating system is operating.
   2. Verify that moisture content of concrete slabs, building air temperature, and relative humidity are within the limits recommended by the manufacturers of the materials used.
   3. Maintain reference markers, holes, and openings that are in place or plainly marked for future cutting by repeating on the finish surface as marked in the subfloor. Use chalk or other non-permanent marking device.

C. Installing Resilient Tiles:
   1. Place units with adhesive cement in strict compliance with the manufacturer's recommendations as approved by the Architect.
      a) Butt units tightly to vertical surfaces, nosing, edgings, and thresholds.
      b) Scribe as necessary around obstructions and to produce neat joints.
      c) Place tiles tightly laid, even, and in straight parallel lines.
      d) Extend units into toe spaces, door reveals, and in closets and similar spaces.
   2. Lay units from center marks established with principal walls, discounting minor offsets, so that units at opposite edges of the room are of equal width.
      a) Adjust as necessary to avoid use of cut widths less than 3" wide at room perimeters.
      b) Lay units square to axes of the room or space.
   3. Match units for color and pattern by using materials from cartons in the same sequence as manufactured and packaged.
   4. Lay in ashlar pattern with grain in all units running the same direction, unless otherwise directed by the Architect.
   5. Place resilient edge strips tightly butted to units and secured with adhesive, providing at all unprotected edges unless otherwise shown.

D. Installing Base:
   1. Install base where shown on the Drawings.
   2. Use factory-preformed exterior corners, and factory preformed or job-mitered interior corners.

3.4 CLEANING AND PROTECTING

A. Remove excess adhesive and other blemishes from exposed surfaces, using neutral cleaner recommended by the manufacturer of the resilient materials.
B. Apply 2 coats of gloss wax. Utilize products recommended by the flooring manufacturer.
C. Provide two (2) copies of manufacturer's recommendations for cleaning to the Architect.

END OF SECTION

SECTION 09900
PAINTING

PART 1 – GENERAL

1.1 SUMMARY

A. Paint and finish exposed surfaces using the combination of materials listed on Painting Schedule in Part 3 of this Section, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Priming or priming and finishing of certain surfaces may be specified to be factory-performed or installer performed under pertinent other Sections.
   3. Division 15000 and Division 16000.

C. Work Not Included:
   1. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, pipe spaces, and duct shafts.
   2. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be so specified.
   3. Do not paint moving parts of operating units, mechanical or electrical parts such as linkages, sensing devices, and motor shafts, unless otherwise indicated.
   4. Do not paint over required labels or equipment identification, performance rating, name, or nomenclature plates.

D. Definitions:
   1. “Paint” as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 45 calendar days after the Contractor has received the Owner’s Notice to Proceed submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements.

C. Samples:

1. Following the selection of colors and glosses by the Architect, submit Samples for the Owner's review.
    a) Provide three Samples of each color and each gloss for each material on which the finish is specified to be applied.
    b) Except as otherwise directed by the Architect, make Samples approximately 8" x 10" in size.
    c) If so directed by the Architect, submit Samples during progress of the Work in the form of actual application of the approved materials on actual surfaces to be painted.
2. Revise and resubmit each Sample as requested until the required gloss, color, and texture is achieved. Such Samples, when approved, will become standards of color and finish for accepting or rejecting the Work of this Section.
3. Do not commence finish painting until approved Samples are on file at the job site.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Project sample walls shall be selected and utilized to verify all color selections for the project. The Architect shall designate the sample locations which may be incorporated into the work. The samples areas shall be preserved to the completion of the painting work.

C. Paint Coordination:
1. Provide finish coats which are compatible with the prime coats actually used.
2. Review other Sections of These Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
3. Upon request, furnish information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
4. Provide barrier coats over noncompatible primers, or remove the primer and reprime as required.
5. Notify the Owner in writing of anticipated problems in using the specified coating systems over prime-coatings supplied under other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

1.5 SITE CONDITIONS

A. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 degrees F, unless otherwise permitted by the manufacturers' printed instructions as approved by the Architect.

B. Weather Conditions:
1. Do not apply paint in rain, fog, or mist, or when the relative humidity exceeds 85%, or to damp or wet surfaces.

2. Applications may be continued during inclement weather only within the temperature limits specified by the paint manufacturer as being suitable for use during application and drying periods.

1.6 MAINTENANCE

A. Upon completion of the Work of this Section, deliver to the Owner an extra stock equaling two (2) gallons (2 1-gallon containers) of each color, type, and gloss of paint used in the Work, tightly sealing each container, and clearly labeling with contents and location where used. Provide a color mix schedule indicating manufacturer, color name, color number, mix content, and areas of the project utilized. Bind into project close-out documents.

PART 2 – PRODUCTS

2.1 PAINT MATERIALS

A. Acceptable Materials:
   1. The Painting Schedule in Part 3 of this Section is based, in general, on products of the Flex Bon Paints.
   2. Equal products of Benjamin Moore or Scott Paints may be substituted in accordance with provisions of the Contract.
   3. Where products are proposed other than those specified by name and number in the Painting Schedule, provide under the products data submittal required by Article 1.2 of this Section, a new painting schedule compiled in the same format used for the Painting Schedule included in this Section.

B. Undercoats and Thinners:
   1. Provide undercoat paint produced by the same manufacturer as the finish coat.
   2. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits.
   3. Insofar as practicable, use undercoat, finish coat, and thinner materials as parts of a unified system of paint finish.

2.2 COLOR SCHEDULES

   1. The project colors shall be as selected by the Architect.

2.3 APPLICATION EQUIPMENT

A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.

B. Prior to use of the application equipment, verify that the proposed equipment is actually compatible with the material to be applied, and that integrity of the finish will not be jeopardized by use of the proposed equipment.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 MATERIALS PREPARATION

A. General:
   1. Mix and prepare paint materials in strict accordance with the manufacturers' recommendations as approved by the Architect.
   2. When materials are not in use, store in tightly covered containers.
   3. Maintain containers used in storage, mixing and application of paint in a clean condition, free from foreign materials and residue.

B. Stirring:
   1. Stir materials before application, producing a mixture of uniform density.
   2. Do not stir into the material any film which may form on the surface, but remove the film and, if necessary, strain the material before using.

3.3 SURFACE PREPARATION

A. General:
   1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturers' recommendations.
   2. Remove removable items which are in place and are not scheduled to receive paint finish; or provide surface applied protection prior to surface preparation and painting operations.
   3. Following completion of painting in each space or area, reinstall the removed items by using workmen who are skilled in the necessary trades.
   4. Clean each surface to be painted prior to applying paint or surface treatment.
   5. Remove oil and grease with clean cloths and cleaning solvent of low toxicity and flash point in excess of 200 degrees F, prior to start of mechanical cleaning.
   6. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall into wet newly painted surfaces.

B. Preparation of Wood Surfaces:
   1. Clean wood surfaces until free from dirt, oil, and other foreign substance.
   2. Smooth finished wood surfaces exposed to view using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.

3. Do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture meter approved by the Architect.

C. Preparation of Metal Surfaces:
   1. Thoroughly clean surfaces until free from dirt, oil, and grease.
   2. On galvanized surfaces, solvent clean all surfaces to remove all traces of grease or oil with high flash solvent such as naptha or lacquer thinner.
   3. Allow to dry thoroughly before application of paint.

3.4 PAINT APPLICATION

A. General:
   1. Touchup shop-applied prime coats which have been damaged, and touchup bare areas prior to start of finish coats application.
   2. Slightly vary the color of succeeding coats.
      a) Do not apply additional coats until the completed coat has been inspected and approved.
      b) Only the inspected and approved coats of paint will be considered in determining the number of coats applied.
   3. Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
   4. On removable panels and hinged panels, paint the back sides to match the exposed sides.

B. Drying:
   1. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.
   2. Consider oil-base and oleo-resinous solvent-type paint as dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Brush Applications:
   1. Brush out and work the brush coats onto the surface in an even film.
   2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.

D. Spray Application:
   1. Except as specifically otherwise approved, confine spray application to metal framework and similar surfaces where hand brush work would be inferior.
   2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.
   3. Do not double back with spray equipment to build up film thickness of two coats in one pass.

E. For completed work, match the approved Samples as to texture, color and coverage. Remove, refinish, or repaint work not in compliance with the specified requirements.

F. Miscellaneous Surfaces and Procedures:

1. Exposed mechanical items -
    a) Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents and items of similar nature to match the adjacent wall and ceiling surfaces, or as directed.
    b) Paint visible duct surfaces behind vents, registers, and grilles flat black.
    c) Wash metal with solvent, prime, and apply two coats of alkyd enamel.
2. Exposed pipe and duct insulation -
    a) Apply one coat of latex paint on insulation which has been sized or primed under other Sections. Apply two coats on such surfaces when unprepared.
    b) Match color of adjacent surfaces.
    c) Remove band before painting, and replace after painting.
3. Hardware -
    a) Paint prime coated hardware to match adjacent surfaces.
    b) Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the Architect.
4. Wet areas -
    a) In toilet rooms and contiguous areas, add an approved fungicide to paints.
    b) For oil base paints, use 1% phenolmercuric or 4% tetrachlorophenol.
    c) For water emulsion and glue size surfaces, use 4% sodium tetrachlorophenate.

3.5 PAINTING SCHEDULE

A. Provide the following paint finishes or if not listed utilize the paint manufacturers recommended product:
1. Exterior Ferrous Metal Use (Except Guard Posts) -
    a) 1 coat Interior-Exterior Alkyd Rust Inhibitive Metal Primer
    b) 2 coats PREMIUM Exterior Low Sheen 100% Acrylic Latex House & Trim Paint.
2. Exterior Guard Posts -
    a) 1 coat primer
    b) 2 coats Heavy Duty Polyurethane Enamel
3. Exterior Galvanized Metal Use -
    a) 1 coat Exterior 100% Acrylic Latex Primer
    b) 2 coats PREMIUM Exterior Low Sheen 100% Acrylic Latex House & Trim Paint.
4. Exterior Concrete & Cement Plaster (Stucco) -
    a) 2 coats PREMIUM Exterior Low Sheen 100% Acrylic Latex House & Trim Paint.
5. Exterior Wood -
    a) 1 coat Exterior 100% Acrylic Latex Primer
    b) 2 coats PREMIUM Exterior Low Sheen 100% Acrylic Latex House & Trim Paint.
6. Interior Concrete Masonry Walls -
    a) 1 coat Aqualock Primer
    b) 1 coat 2 part epoxy semi-gloss (EPX)
7. Interior Flat Wall & Ceiling Finishes on Gypsum Board or Veneer Plaster (Hardcote) -
    a) 2 coats Interior-Exterior Latex Paint. (F)
8. Interior Enamel Wall Finishes on Gypsum Board or Veneer Plaster (Hardcote) -
    a) 1 coat Interior Acrylic Latex Primer
    b) 1 coat CLASSIC Interior-Exterior Semi-Gloss Alkyd Enamel. (SGE)
9. Interior Epoxy Wall Finish Use -

c) 1 coat Aqualock Primer
d) 1 coat 2 part epoxy semi-gloss. (EPX)

10. Interior Metals Use -
    a) 1 coat Interior-Exterior Alkyd Rust Inhibitive Metal Primer.
    b) 2 coats PREMIUM Interior Semi-Gloss Alkyd Enamel.
11. Interior Galvanized Metal Use -
    a) 1 coat Exterior 100% Acrylic Latex Primer.
    b) 1 coat PREMIUM Interior Semi-Gloss Alkyd Enamel.
12. Interior Wood Doors, Frames, Casing, Base, Unfinished Woodwork, Etc., Use -
    a) 1 coat Interior Alkyd Primer.
    b) 2 coats PREMIUM Interior Semi-Gloss Alkyd Enamel.

END OF SECTION

SECTION 10120
TACKBOARDS AND MARKERBOARDS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide tackboards and markerboards where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 Manufacturers:
   1. Standard: Claridge Products and Equipment, Inc.
   2. Acceptable other manufacturer's – AKI, Greesteel, Inc., Caroline Chalkboard Co., American, and Florida Education Systems.

2.2 MARKERBOARDS

A. Provide markerboards where shown on the Drawings. The height and length as shown on the Drawings, and with the following attributes:

B. Shall be factory-built and framed units.

C. Liquid Chalk Porcelain Enamel Writing Surface (markerboards) shall be applied over 24 gauge steel sheet. Backerboard shall be 7/16" or 3/8' HARDBOARD. Rear face of backerboard shall be covered with 015" aluminum foil. Writing surface shall be white.

D. Porcelain coating shall demonstrate no cracks or ruptures in the bond after dropping a 1" diameter steel ball with an impact of 80 lbs. on a 1" ball resting on markerboard surface.

E. Markerboard trim shall be extruded aluminum ¾" minimum wide designed to be mounted with 2" aluminum angle hangers and concealed fasteners. Marker trough shall project 2-¾" from face of markerboard and shall be full length of markerboard. Top rail of markerboards shall have special aluminum trim designed to receive integral cork strip for function as a display and map rail.

F. Provide end stops at each end of cork strip. Cork strip shall be same material and color as tackboard specified in this section.

G. Trim shall be similar to Series 3 as manufactured by Claridge Products and Equipment Co.

H. Accessories: Each markerboard shall receive the following:
   1. One Map and Display Rail full width of markerboard minimum 1 3/8" wide
      a) Two Metal Map Hooks per every 4 (four) lineal feet of markerboard
      b) Flat End Stops
      c) Color by Architect

I. Color as selected by Architect from manufacturer's standard colors.

2.3 TACKBOARDS

A. Provide tackboards where shown on the Drawings. The height and length as shown on the Drawings, and with the following attributes:

B. Tackboards shall be factory built and framed units.

C. Frame shall match markerboards but without marker tray.

D. Provide map rail, specified above, with each unit where adjacent to markerboards.

E. Provide mildew-resistant, washable, vinyl fabric complying with FS CCC-W-408, Type II, weighing not less than 13 ounces per square yard, laminated to ¼ inch thick cork sheet.

Provide fabric that has a flame spread rating of 25 or less when tested in accordance with ASTM E84. Provide color and texture as scheduled or a selected from the manufacturer's standards.

F. Backing – Make panel rigid by factory laminating cork face sheet under pressure to 3/8 inch thick fiberboard backing.

G. Color selected by the Architect.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 GENERAL

A. Install markerboards and tackboards at locations and heights as shown on the drawings and in accordance with manufacturer's printed instructions. Markerboards, and tackboards units shall be mounted to walls utilizing 2" aluminum angle clips securely fastened to wall with ¼" toggle bolts with trim connected to clip angles at edges to conceal fasteners. Marker and tackboards shall be mounted securely, plumb and level and free from "give" when pressure is applied.

B. Upon completion of marker installation, markerboards shall be cleaned and "broken-in" as recommended by manufacturer. Tackboard surfaces shall be cleaned thoroughly.

C. Eliminate sharp corners of metal trim such as ends of marker trays.

3.2 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.3 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

3.4 COORDINATION

A. Contractor shall field verify the final location of all marker, tackboards, etc. with Division 16 Contractor(s) and shall provide all cutouts for required outlet interface. Cutouts shall be coordinated and shall be capable of being completely covered by the plate.

3.5 GUARANTEE

A. Markerboard writing surface materials shall be guaranteed free of defects in writing and erasing qualities for fifty years. Guarantee shall be in consideration of normal usage and maintenance of markerboards and shall be limited to replacement of materials only F.O.B. destination and not inclusive of labor costs incidental to removal or reinstallation.

END OF SECTION

SECTION 10165
TOILET COMPARTMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide toilet compartments where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
   1. Types of toilet compartments and screens include -
      a) Solid plastic, homogenous color
   2. Styles of toilet compartments include -
      a) Floor-anchored, overhead-braced
   3. Styles of screens include -
      a) Floor anchored

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Supports for attaching compartments to overhead structural system are specified in a Division 5 Section.
   3. Toilet Accessories such as toilet paper holders, grab bars, and purse shelves, are specified in another Division 10, Section 10800.

1.2 SUBMITTALS

A. General:
   1. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
      a) Product data for materials, fabrication, and installation including catalogue cuts of anchors, hardware, fastenings, and accessories.
      b) Shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
      c) Samples of full range of colors for each type of unit required. Submit 6” square Samples of each color and finish on same substrate to be used in Work, for color verification after selections have been made.

1.3 QUALITY ASSURANCE

A. Field Measurements:
   1. Take field measurements prior to preparation of shop drawings and fabrication where possible to ensure proper fitting of Work. However, if taking field measurements prior to commencement of fabrication will delay the work, then allow for adjustments.

B. Coordination:
    1. Furnish inserts and anchorages that must be built into other work for installation of toilet compartments and related items.
    2. Coordinate delivery with other work to avoid delay.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
    1. Solid Plastic - Polymer Resin:
        a) Capitol Partitions, Inc.
        b) Sanatec Industries, Inc.
        c) Santana Products Company
        d) Sanymetal Products Corporation
        e) Ampco Products, Inc.

2.2 MATERIALS

A. General:
    1. Provide materials which have been selected for surface flatness and smoothness.
    2. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Solid Plastic:
    1. High density, solid polymer resin or polyethylene with homogenous color throughout.
    2. Provide material not less than 1” thick with seamless construction with edges eased.

C. Pilaster Shoes and Caps:
    1. ASTM A167, Type 302/304 stainless steel, not less than 3 inches high, 0.0396” thick (20 gauge).
    2. Finished to match hardware.

D. Stirrup Brackets:
    1. Manufacturer’s standard design for attaching panels to walls and pilasters, either chromium-plated nonferrous cast alloy (“Zamac”) or anodized aluminum.

E. Hardware and Accessories:
    1. Manufacturer’s standard design, heavy duty operating hardware and accessories of chromium-plated, nonferrous cast alloy (“Zamac”).

F. Overhead Bracing:
    1. Continuous extruded aluminum, anti-grip profile, with clear anodized finish.

G. Anchorages and Fasteners:
    1. Manufacturer’s standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, with theft-resistant-type heads and nuts.

2. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

2.3 FABRICATION

A. General:
   1. Furnish standard doors, panels, screens, and pilasters fabricated for compartment system.
   2. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated.

B. Door Dimensions:
   1. Unless otherwise indicated, furnish 24” wide in-swinging doors for ordinary toilet stalls and 32” wide (clear opening) out-swinging doors for stalls equipped for use by handicapped.

C. Overhead-Braced Compartments:
   1. Furnish galvanized steel supports and leveling bolts at pilasters as recommended by manufacturer to suit floor conditions.
   2. Make provisions for setting and securing continuous, extruded, aluminum, anti-grip, overhead bracing at top of each pilaster.
   3. Provide shoe at each pilaster to conceal supports and leveling mechanism.

D. Floor-Supported Compartments:
   1. Furnish galvanized steel anchorage devices complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters to permit structural connection at floor.
   2. Provide shoe at each pilaster to conceal anchorage.

E. Floor-Supported Screens:
   1. Furnish pilasters and panels not less than 1” thick and of same construction and finish as toilet compartments.
   2. Furnish galvanized steel anchorage devices complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters to permit structural connection to floor.
   3. Furnish shoe at pilaster to conceal anchorage.

F. Hardware: Furnish hardware for each compartment to comply with ANSI A117.1 for handicapped accessibility and as follows:
   1. Hinges -
      a) Cutout inset type, adjustable to hold door open at any angle up to 90 degrees.
      b) Provide gravity type, spring-action cam type, or concealed torsion rod type to suit manufacturer’s standards.
   2. Latch and Keeper -
      a) Manufacturer’s standard surface-mounted latch unit, designed for handicapped accessibility, with combination rubber-faced door strike and keeper.
   3. Coat Hook -
      a) Manufacturer’s standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.
   4. Door Pull -
      a) Manufacturer’s standard unit for out-swinging doors.

b) Provide pulls on both faces of handicapped compartment doors.

2.4 FINISH

A. Colors:
1. Two of manufacturer's standard colors in each room, as indicated, or if not indicated, as selected by Architect.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
1. Comply with manufacturer's recommended procedures and installation sequence.
2. Install compartment units rigid, straight, plumb, and level.
3. Provide clearances of not more than ½" between pilasters and panels, and not more than 1" between panels and walls.
4. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel.
5. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall.
6. Secure panels in position with manufacturer's recommended anchoring devices.

B. Overhead-Braced Compartments:
1. Secure pilasters to floor and level, plumb, and tighten installation with devices furnished.
2. Secure overhead brace to each pilaster with not less than two fasteners.
3. Hang doors and adjust so that tops of doors are parallel with overhead brace when doors are in closed position.

C. Screens:
1. Attach with anchoring devices as recommended by manufacturer to suit supporting structure.
2. Set units to provide support and to resist lateral impact.

3.2 ADJUST AND CLEAN

A. Hardware Adjustment:
1. Adjust and lubricate hardware for proper operation.
2. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched.
3. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 10400
IDENTIFYING DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Provide identifying devices where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not limited to:
   1. Building Identification
   2. Door Signs
   3. Miscellaneous Signage

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 60 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Details of installation and anchorage sufficient to enable proper interface of the work of this Section with the work of other trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Design is based on use of standard products manufactured by Interior Graphics, Inc.

B. Provide the products upon which design is based, or provide equal products of another manufacturer including but not limited to Best Manufacturing Sign Systems, Grimco, Inc., Kaltech Industries Group, Inc., Mohawk Sign Systems, Seton Identification Products, or as approved in advance by the Architect.

C. Except as otherwise approved by the Architect, provide all products of this Section from a single manufacturer.

2.2 BUILDING IDENTIFICATION SIGNS

1. Not Used

2.3 SPACE SIGNS

A. Provide 1/8" thick acrylic subsurface graphic signs, laminated to 1/8" backplate, flat panel with radiused corners, ¾" high caps, ½" high lowers, ¾" high numbers, concealed mounting, Times Roman font, ADA braille, color and final layout and placement to be selected by the Architect with the following messages and locations indicated:

Quantity	Message	Location
3	OFFICE	Room 102, 104 and 105
1	EQUIPMENT	Corridor side Rm #109
1	BREAK ROOM	Corridor side Rm #106
1	MEN	Room #114 (With Pictograph)
1	WOMEN	Room #110 (With Pictograph)
1	CUSTODIAL	Room #112
1	SORTING	Room #118 Passage #103 side

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the manufacturers' recommendations as approved by the Architect, using only the approved mounting materials, and locating all components firmly into position, level and plumb.

END OF SECTION

SECTION 10420
CAST PLAQUES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.2 WORK INCLUDED

A. The intent of this Section provides for a complete installation including all materials, labor, equipment, accessories and other incidental items necessary to provide all required plaques.

B. Types of work include, but are not limited to, the following:
1. Cast building plaques.

1.3 RELATED SECTIONS

A. Section 04220 - Concrete Masonry Units (CMU).
B. Section 05410 - Structural Steel Studs.
C. Section 05999 - Miscellaneous Metals and Fabrication.
D. Section 07901 - Caulking and Sealants.
E. Section 09111 - Metal Studs.
F. Section 09220 - Cement Plaster.

1.4 QUALITY ASSURANCE

A. Manufacturer: Minimum of ten (10) years experience in the successful manufacture of required plaques and letters designed for the intended use.

B. Erector: Minimum of five (5) years experience in the successful installation of the required plaque and letter systems and approved by manufacturer. Utilize only experienced personnel trained in proper installation of the products as recommended by the manufacturer.

C. Single Source Responsibility: Provide each type of product wholly obtained from single source. Do not mix components from different manufacturers for single products. Different types of plaques and letters may be from different manufacturers.

D. Field Measurements: Field verify all dimensions at point of location prior to fabrication to ascertain space is available for plaque and letter installation.

E. Coordination: Contractor to coordinate all trades to allow for timely inclusion in the work all items necessary for a complete installation. Provide miscellaneous steel

shapes anchored within wall to fully support all loads of the cast plaques and letters. Coordinate location of steel with mounting template for each plaque or letter.

F. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly label all components for reassembly and coordinated installation.

1.5 REFERENCES

A. For cast plaques, the following references are applicable: Aluminum Association Alloy Designation C443.2; Copper Development Association Alloy C92700 - 88% copper, 10% tin, 2% lead for cast bronze; Copper Development Association Alloy C85200 - 72% copper, 3% lead, 1% tin, 24% zinc for cast brass.

B. For cast letters (if illustrated and required), the following references are applicable: Aluminum Association Alloy Designation C443.2 (for Anodic Coatings, 514.2 or A514.2) for cast aluminum; Copper Development Association Oshalloy C83450 - 88% copper, 2-1/2% tin, 2% lead, 6-1/2% zinc and 1% nickel for cast bronze; Copper Development Association Alloy C85200 - 72% copper, 1% tin, 3% lead, 24% zinc for cast brass.

C. The National Association of Architectural Metal Manufacturers (NAAMM).

1.6 SUBMITTALS

A. Product Data: In accordance with Section 01340; include manufacturer's technical data, literature, installation and maintenance instructions and details for all products.

B. Shop Drawings: In accordance with Section 01340; indicate locations, sizes, dimensions, lettering, installation methods, edge details, anchorage, textures, adjacent construction requirements, construction details, connections, and drawing showing all required lettering and other information.

C. Samples: In accordance with Section 01340; submit three (3) full-size film negatives for each plaque prior to casting and a full-size mounting template for each plaque. Plaque shall match approved film negatives. Submit three (3) copies of scaled drawings for all copy using specified letter style and text.

D. Certificates: Submit manufacturer's certificate indicating that all products conform fully with Specification and Drawing requirements.

E. Maintenance Data: In accordance with Section 01730; provide manufacturer's written instructions regarding required maintenance procedures, including cleaning methods recommended.

1.7 DELIVERY, STORAGE AND HANDLING

A. In accordance with Section 01600.

B. Deliver materials in original cartons labeled with manufacturer's name. Protect all products from damage. Contractor shall inspect all delivered products to verify quantity, quality and correctness prior to accepting delivery. Immediately correct all unacceptable items.

C. Store materials in a dry, well ventilated area, under cover and protected from the elements or damage. Do not store in direct sunlight, excessive heat or cold.

D. Follow manufacturer's directions regarding delivery, storage and handling. Replace all damaged items with new materials at no additional cost to Owner.

1.8 WARRANTY

A. Submit in accordance with Section 01740; include correct number of copies, approved dates for start and ending of warranty, complete coverage for time period indicated, signatures, company name, address, phone number and responsible individual to contact, and other information necessary to process the warranty.

B. Manufacturer: Provide minimum two (2) year warranty covering complete installed plaques and letters to take effect after installation and acceptance of all components by Architect and Owner.

C. Installer: Provide minimum two (2) year warranty covering all installation and workmanship of complete systems to take effect after acceptance of all components by Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to full compliance with all requirements, the following manufacturers offer products that may be incorporated into the work:
   1. A.R.K. Ramos Architectural Signage Systems.
   2. Leeds Aluminum Letters, Inc.
   3. Matthews Bronze Division - Architectural Products.
   4. Metallic Arts, Inc.
   5. Newman Brothers, Inc.
   6. OMC Industries, Inc.
   7. The Southwell Company.

B. Other manufacturers with products that comply with all requirements may be acceptable upon complete data submittal and Architect approval prior to Bidding in accordance with Division 1.

2.2 CAST METAL PLAQUES

A. Building Plaque:
   1. Material: [Cast Aluminum]
   2. Size & Design: 16” wide by 20” high, or as shown on Drawings. Cast plaque shall accurately depict the indicated design in all respects.
   3. Letter Style/Size: (New Times Roman, height as indicated on the drawings).
   4. Border Style: [Single Line].
   5. Type Code: [Upper Case].
   6. Background Texture: [Pebbled].
   7. Mounting Method: [Concealed Bosses and Studs]
   8. Background Color: Selected by Architect from complete range of available colors and finishes.
   9. Copy: As indicated on Drawings.
   10. Finish: All raised design features and letters shall be: [Satin Aluminum per NAAMM AAM42M33C11R10].
   11. Plaque shall be cast in one (1) single piece. No splices or pieces permitted.

B. All plaques shall receive a final clear coat protective finish to inhibit oxidation and preserve the original luster of the plaques. Protective finish shall maintain clarity without yellowing with age and shall not peel, flake, chalk or otherwise cause a change of appearance on the plaque.

2.3 ACCESSORIES

A. Mounting Hardware: Utilize hot dipped galvanized threaded studs at interior locations and stainless steel high strength threaded studs at exterior locations or locations exposed to moisture.

2.4 FABRICATION

A. Workmanship: Use materials of size and thickness indicated, or if not indicated, as otherwise required to produce finished product appropriate for use intended.

B. Tolerances: Manufacture all items within the tolerances allowed by ASTM, NAAMM and AAMA for the type material and method being used. Items fabricated outside these tolerances shall be replaced with new materials meeting all requirements at no additional cost to Owner.

C. Shop Fabrication: Fabricate all items in factory or shop facilities to the greatest extent possible to eliminate field work. Plaques and letters shall be fabricated totally in the shop. Mounting hardware shall be fabricated as much as possible in the shop, with field work done to finalize connections.

D. Mounting: Mounting hardware secured to plaques and letters shall be located as indicated on the submitted mounting template. Improperly located mounting studs or pre-drilled holes shall be corrected by the manufacturer at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Conditions: Contractor shall examine all areas to receive plaques and letters prior to installation to determine that conditions are satisfactory. Verify that conditions are complete, properly cured, all backup is in place, correctly sized, preliminary work is complete, level, aligned, plumb and ready for required work.

B. Acceptability: Do not proceed with work until all conditions are satisfactory. Beginning preparation or installation indicates acceptability of conditions and responsibility for performance of entire installed system complying with all requirements.

3.2 PREPARATION

A. Field Measurements: Field verify all dimensions prior to fabrication to ascertain proper fit of items in designated area. Indicate all field verified dimensions on Shop Drawings.

B. Protection: Protect all adjacent surfaces to prevent damage. Do not allow work to proceed until protection is in place. Repair or replace all damaged surfaces to new condition at no additional cost to Owner.

C. Anchorage: Install all required anchors, clips, brackets, backup support, bracing, embeds, etc., prior to installation of plaques and letters.

D. Surface Preparation: Ascertain all surfaces to receive materials are clean, dry, cured and properly prepared. Apply all coatings to wall surface to finish the wall prior to installation of plaques and letters. Ensure that manufacturer's protective finish coat has been installed on all plaques and letters prior to delivery.

3.3 INSTALLATION

A. Manufacturer's Instructions: Install complete assemblies in accordance with manufacturer's printed instructions, Drawings, Specifications and as required by all applicable codes or governing authorities.

B. Tolerances: Set all items level, plumb, properly aligned and level. Recessed items shall be flush with adjacent surfaces. Correct all work not so installed to meet requirements at no additional cost to Owner.

C. Coordination: Coordinate with other trades all requirements for timely inclusion in the work. In particular, coordinate required backup reinforcement and anchoring for all plaques and letters.

D. Dimensions: Install all items to required dimensions, including depth and height.

E. Backup Support: Install miscellaneous steel shapes for backup to anchor plaques

and letters. Steel shall be galvanized per G90 for exterior or wet applications and prime coated for interior applications.

3.4 ADJUSTMENT

A. Alignment: Adjust all installed items for proper fit and alignment.

B. Reinstallation: Where required, temporarily remove items to allow for installation of adjacent work or finishes and to allow for protection of plaques and letters. Install temporary protection of removed items. When work progresses sufficiently, reinstall removed items.

C. Final Adjustment: After adjacent work is complete, adjust and tighten all items for secure fit complying with requirements. Ensure that all plaques and letters are secured rigidly in place.

3.5 PROTECTION

A. Protect all items in accordance with Section 01600 and manufacturer's recommendations.

B. Adjacent Materials: Protect adjacent materials during installation to prevent damage. Maintain protection until installation is complete and properly secured.

C. Protected Items: During and after installation, protect all plaques and letters from damage and deleterious or soiled conditions until final acceptance. Just prior to final acceptance, remove any protective coverings or coatings.

D. Replacement: Repair or replace all damaged or stained items to new condition at no additional cost to Owner.

E. Maintenance: Follow all recommendations of the manufacturer. Should any item get scratched, gouged, chipped or other condition damaging to the surface finish, promptly touch-up areas with a matching colored or clear lacquer to prevent oxidation. Follow manufacturer's written instructions.

3.6 CLEANING

A. Clean all items in accordance with Section 01710 and manufacturer's recommendations.

B. Pre-Installation: Prior to installation, thoroughly clean all surfaces on which plaques and letters are located to remove all dirt, debris, moisture or other harmful conditions.

C. During Installation: Maintain work area in a clean condition. Daily remove all waste, discarded items, excess materials and other items unnecessary for the completed work.

D. Post-Installation: When work is complete, thoroughly clean all work areas, surfaces, plaques and letters, and other soiled areas of waste, excess materials, debris, dirt, equipment and other items no longer necessary. Use only materials approved by the manufacturer for use on their products. General cleaning is accomplished using a damp soft cloth to wipe the surfaces. Never use anything stronger than a mild detergent to wash plaques or letters. Do not use any abrasive materials on any plaque or cast letters. Leave area clean, acceptable and ready for next trade or Owner's use.

END OF SECTION

SECTION 10444
FABRICATED ALUMINUM LETTERS AND LOGOS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.2 WORK INCLUDED

A. Furnish and install fabricated aluminum letters and logos as indicated on Drawings.

1.3 GENERAL

A. Aluminum letters and logos shall be the product of a single manufacturer including necessary mounting accessories, fittings and fastenings.

B. Do not deliver units until ready for their installation. Protect from damage during delivery, handling, storage and installation.

1.4 SUBMITTALS

A. Prepare and submit Shop Drawings showing dimensional elevations and details at 1-1/2" = 1'-0" scale. Show letter style, size and letter spacing. Indicate material, finish and mounting method for Architect's approval.

PART 2 - PRODUCTS

2.1 FABRICATED ALUMINUM LETTERS AND LOGOS

A. Letters shall be aluminum of Aluminum Association Alloy Designation A514.0, satin faced, filed and ground edges.

B. Letters shall be free of all porosity and with sharp corners, flat faces and accurate profiles. Remove burrs and rough spots. Sand all faces to uniform lustre. Sides shall be filed smooth with all tool marks removed by fine abrasive grain blasting or other suitable methods.

C. Letter style and shall be “Arial” font.

D. Capital height size shall be 6” and 8” as indicated on the drawings.

E. Depth of letters shall be 1/4".

F. Finish shall be electrostatically painted; color indicated or selected by Architect.

G. Approved Manufacturers: Ace Neon; Heath; Melweb; Peninsular or equivalent approved in advance by the Architect.

2.2 MOUNTING

A. Devices shall be furnished by letter manufacturer.

B. Letters shall be mounted with poly pads and structural adhesive. Letters shall be projected 1" with aluminum spacer sleeves or as required to level on the wall surface.

C. Manufacturer shall furnish scaled Shop Drawings for Architect's approval. Full-size drilling template for stud locations shall be furnished for use when installing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lay out letters in accordance with Shop Drawings, straight, true and properly spaced.

B. Mount as described herein.

3.2 CLEANING

A. Clean letters as required, removing all foreign matter. Do not scratch or mar finish.

END OF SECTION

SECTION 10500 - METAL LOCKERS

PART 1 - GENERAL

RELATED DOCUMENTS

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

SUMMARY

This Section includes metal lockers and related equipment as indicated on drawings.

Types of products in this section include the following:

Standard wardrobe lockers.

Double-tier.

Wood sleepers are specified in Division 6.

SUBMITTALS

Submit the following in accordance with Conditions of Contract and Division Specification sections.

Product data and installation instructions for metal locker units.

Color Samples on squares of same metal to be used for fabrication of lockers.

Shop Drawings that show metal lockers in dimensioned relation to adjacent surfaces. Show lockers in detail, method of installation, fillers, trim, base, and accessories. Include locker numbering sequence information.

Combination Listing for combination locks and their respective locker numbers. Coordinate with shop drawings submittal, if required.

QUALITY ASSURANCE

Uniformity: Provide metal lockers that are standard products of single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.

JOB CONDITIONS

Do not deliver metal lockers until building is enclosed and ready for locker installation. Protect from damage during delivery, handling, storage, and installation.

PART 2 - PRODUCTS

MANUFACTURERS

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:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

De Bourgh Manufacturing Co.
The Interior Steel Equipment Co.
Lyon Metal Products
Medart Inc.
Penco Products Inc.
Republic Storage Systems

MATERIALS

Sheet Steel: Mild cold-rolled and leveled furniture steel, free from buckle, scale, and surface imperfections.

Fasteners: Cadmium, zinc, or nickle plated steel; exposed bolt heads, slotless type; self-locking nuts or lock washers for nuts on moving parts.

Equipment: Hooks and hang rods of cadmium-plated or zinc-plated steel.

FABRICATION, GENERAL

Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch. Weld frame members together to form rigid, one-piece structure. Weld, bolt, or rivet other joints and connections. Grind exposed welds flush. Do not expose bolts or rivet heads on fronts of locker doors or frames.

Frames: Fabricate of 16-gage channels or 12-gage angles, minimum, with continuous stop/strike formed on vertical members.

Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and nonferrous metal.

Color: Provide locker units in color(s) selected by Architect from manufacturer's standards. Concealed parts may be manufacturer's standard neutral color.

WARDROBE LOCKERS

Body: Fabricate back and sides of minimum 24-gage steel, with double-flanged connections extending full height. Form top and bottom of not less than 24-gage steel, with flanged edges.

Form exposed ends of non-recessed lockers of minimum 16-gage steel.

Door: One-piece, minimum 16-gage sheet steel, flanged at all edges, constructed to prevent springing when opening or closing. Fabricate to swing 180 degrees.

Reinforcing: Provide extra bracing or reinforcing on inside of doors over 15 inches wide.

Ventilation: Provide stamped, louvered vents in door face, as follows:

Double-tier lockers: Not fewer than 3 louver openings top and bottom.

Hinges: Steel, full-loop, 5-knuckle, tight pin. Weld to inside of frame and secure to door with not fewer than 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed.

Provide at least 3 hinges for each door over 42 inches high; at least 2 hinges for each door 42 inches high or less.

Projecting Handle and Latch: Positive automatic, prelocking, pry-resistant latch and pull with rubber silencers; chromium- plated, heavy-duty, vandalproof lift-up handle, containing strike and

eye for padlock; and with latching action as follows:

Recessed Handle and Latch: Housing to form recess for latch lifter and locking devices; nonprotruding latch lifter containing strike and eye for padlock; and automatic, prelocking, pry-resistant latch mechanism with latching action as follows:

Double-tier lockers: Not less than 2-point latching.

Acoustical Treatment: Provide construction treatment designed for significant reduction of noise of locker operation, including protected sound-absorbing material; nylon or plastic coatings on operating components to prevent metal-to-metal contact, and latching mechanism designed to operate without rattling.

LOCKER ACCESSORIES

Locking: Fabricate lockers to receive the following locking devices: Owner shall provide padlocks for student use and are not included in the Contract.

Equipment: Furnish each locker with the following items, unless otherwise shown:

Double-Tier Units: One double-prong hook and not fewer than 2 single-prong wall hooks.

Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous metal number plates with numerals not less than 3/8 inches high. Number lockers in sequence as directed by Architect. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

Continuous Metal Base: Minimum 20-gage cold-rolled steel, fabricated in lengths as long as practicable to enclose base of lockers without additional fastening devices. Flange bottoms inward 3/4 inch for stiffening. Factory-finish metal base to match lockers.

Continuous Sloping Tops: Not fewer than 20-gage sheet steel, approximately 25 degrees pitch, in lengths as long as practicable, but not less than 4 lockers. Provide closures at ends. Finish to match lockers.

Separators: Provide horizontal dividers of not less than 16-gage sheet steel between doors of multiple-tier lockers to ensure rigidity.

Filler Panels: Provide filler panels where indicated, of not less than 18-gage steel sheet, factory fabricated and finished to match locker units.

PART 3 - EXECUTION

INSTALLATION

Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.

Space fastenings about 48 inches o.c., unless otherwise recommended by manufacturer, and apply through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

Install trim, metal base, sloping top units, and metal filler panels and end panels, using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

ADJUST AND CLEAN

Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

Touch-up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10500

SECTION 10520
FIRE EXTINGUISHERS AND CABINETS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide fire extinguishers and cabinets where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Submit to the Owner the following:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Dimensioned drawings as needed to depict the space required for these items, and their interface with the work of other trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 CABINETS

A. Where shown on the Drawings as a cabinet requirement provide J.L. Industries "Fire-FX", "ADAC", Panorama 1817 "PV42", 2-1/2" RT clear aluminum trim, semi-recessed steel cabinets, or equal products of other manufacturers approved in advance by the Architect.

2.2 FIRE EXTINGUISHERS

A. At each fire extinguisher cabinet, provide one multipurpose chemical fire extinguisher with UL rating of 2A-10B;C, J.L. Industries Model “Cosmic 5-E” or equal or as indication on the drawings which ever may be the larger or most costly.

B. At each additional fire extinguisher location, provide J.L. Industries Model “Cosmic 5-E” extinguisher with J.L. Industries “MB 818” bracket or as indication on the drawings which ever may be the larger or most costly.

C. Service, charge, and tag each fire extinguisher not more than ten (10) calendar days prior to the Date of Substantial Completion of the Work as that Date is established by the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the Work of this Section.

B. Install the Work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer’s recommended installation procedures as approved by the Owner, anchoring all components firmly into position for long life under hard use.

C. Locate bracket-mounted extinguishers as location on the drawings and where directed by the Fire Department official.

END OF SECTION

SECTION 10800
TOILET ROOM ACCESSORIES

PART 1 – GENERAL

1.1 SUMMARY

A. Provide toilet room accessories where indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

2.1 TOILET ROOM ACCESSORIES

A. Provide the following products of A & J Washroom Accessories, Bobrick Washroom Equipment Company, or equal approved in advance by the Architect. As a design basis only the products of Bobrick have been identified on the drawings.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the Work of this Section.

B. Install each item in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 11132
PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide projection screens where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division l of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

B. Upon completion of the installation, retain the switch key in a secure location to prevent unauthorized operation of the screen motor.

PART 2 - PRODUCTS

2.1 PROJECTION SCREENS

A. Where indicated on the Drawings, provide the following products of Dalite Screen Co., Inc., State Road 15 North, Warsaw, Indiana 46580 (219) 267-8101, or equal products of other manufacturer approved in advance by the Architect.

1. Dalite "Executive Electrol" projection screens with the following attributes:
    a. Size 70” by 70”, with 24” of black extra drop, Type 3, bottom closure;
    b. With motor operator for 115 V, 60 Hz, 3.5 amp system, using key operated three (3) position switch and stainless steel cover plate.

B. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life.

C. Put each operating component through at least five complete operating cycles, and adjust as needed to achieve optimum operating status.

END OF SECTION

SECTION 12490
HORIZONTAL MINI-BLINDS

PART 1 – GENERAL

1.1 SUMMARY

A. Provide horizontal mini-blinds where shown on the Drawings, as specified herein, and as needed for a complete and proper installation. Blinds shall be installed at all exterior window and sidelight locations (excepting the entry curtain walls or doors).

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product Data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
   3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
   4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01620.

PART 2 – PRODUCTS

A. Manufacturers:
   1. Standard – Levolor Home Fashions.

2. Acceptable manufacturers – Hunter Douglas, Springs Window Fashions Division, Inc. or equal products by other manufacturers approved in advance by the Architect.

B. Materials:
   1. Model: Riviera LightMaster DustGuard 1”
   2. Headrail: 0.025” thick Tomized steel. U-shaped, 1” high x 1 9/16” wide. All hardware enclosed in the headrail.
   3. Guardian Tilter: 0.042” Tomized steel housing with a self-lubricating nylon, automatically disengaging worm and gear mechanism to eliminate overdrive.
   4. Tilt Wand: Solid, transparent with a hexagonal cross section 5/16” across flats.
   5. Cord Lock: 0.042” thick Tomized steel. Crashproof.
   6. Drums and Cradles: Provided with each ladder. Drums are 0.031” thick Tomized steel. Cradles are 0.042” thick Tomized steel.
   7. Installation Brackets: 0.048” thick Tomized steel with a rivet-hinged safety locking front cover to permit removal of headrail without lateral movements.
   8. Ladders slat supports): Distance between slats does not exceed 18mm (nominally 16.7 slats per vertical foot).
   9. Slats: 5000 series magnesium aluminum alloy which includes recycled aluminum materials. Slats are nominally 1” wide and the thickness of the slats is nominally 0.0085”. Coating includes DustGuard, a patented paint process that disrupts the natural static attraction of airborne dust particles, reducing dust buildup on the slat 50% to 70%
   10. Slat Design: Unperforated
   11. Bottomrail: 0.031” thick Tomized steel.

C. Color: White (painted) non gloss.

D. Warranty: Manufacturer’s standard Lifetime Warranty

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, and the manufacturer’s recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

END OF SECTION

SECTION 13122 - METAL BUILDING SYSTEMS

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 a single-story, single-span, rigid-frame-type pre-engineered metal building of the nominal length, width, eave height, and roof pitch indicated.

1. Exterior walls are covered with field-assembled insulated wall panels attached to framing members using exposed fasteners. Endwalls are not expandable.
2. Roof system consists of the manufacturer's standard standing-seam insulated roof.
3. Manufacturer's standard building components and accessories may be used, provided components, accessories, and complete structure conform to design indicated and specified requirements.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Concrete floor and foundations and installation of anchor bolts are specified in Division 3 Section "Concrete Work."
2. Masonry exterior walls are specified in Division 4 Section "Unit Masonry."
3. Sealants and caulking are specified in Division 7 Section "Joint Sealers."
4. Finish hardware and provisions for masterkeying are specified in Division 8 Section "Finish Hardware."

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from winds, gravity, structural movement including movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure.

1. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual."

B. Design Loads: Basic design loads, as well as auxiliary and collateral loads, are indicated on the drawings.

1. Basic design loads include live load, wind load, and seismic load, in addition to the dead load.
2. Auxiliary loads include dynamic live loads such as those generated by cranes and material handling equipment.
3. Collateral loads include additional dead loads over and above the weight of the metal building system such as sprinkler systems and roof-mounted mechanical systems.

C. Structural Framing and Roof and Siding Panels: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual."

1. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
2. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
3. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

D. Building Accessories: Provide metal building system accessories that comply with the following criteria:

1. Hollow Metal Doors and Frames: Comply with the Steel Door Institute's SDI-100 for types, styles, and design requirements and with ANSI A115 for hardware preparation.
2. Aluminum Windows: Comply with AAMA 101 for window-type designations and performance requirements.
3. Steel Windows: Comply with the Steel Window Institute's (SWI) "Recommended Specifications for Steel Windows" for grade classification and types.
4. Glass: Comply with ASTM C 1036 for glass type, class, quality, style, kind, and form and with recommendations of the Flat Glass Marketing Association's (FGMA) "Glazing Manual."

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and

Division 1 Specification Sections.

B. Product data consisting of metal building system manufacturer's product information for building components and accessories.

C. Shop drawings for metal building structural framing system, roofing and siding panels, and other metal building system components and accessories that are not fully detailed or dimensioned in manufacturer's product data.

1. Structural Framing: Furnish complete erection drawings prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located. Include details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections.
2. Roofing and Siding Panels: Provide layouts of panels on walls and roofs, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Include transverse cross-sections.
3. Building Accessory Components: Provide details of metal building accessory components to clearly indicate methods of installation including the following:

    a. Personnel doors: Provide elevations and details of each type of door and frame, including anchors and reinforcement; show location and installation requirements for finish hardware. Provide schedule of doors and frames using the same reference numbers for details and openings as those indicated on the drawings; include complete hardware schedule.
    b. Overhead Coiling Service Doors: Provide fully dimensioned details of construction, including 1/4-inch scale elevations of door units and not less than 3/4-inch scale details showing door curtain, guides, counterbalance, and method of operation.
    c. Aluminum Windows: Provide 1/4-inch scale elevations of window units and not less than 3/4-inch scale details showing anchors, hardware, operators, and glazing details.
    d. Steel Windows: Provide 1/4-inch scale elevations of window units and not less than 3/4-inch scale details showing anchors, hardware, operators, and glazing details.
    e. Sheet Metal Accessories: Provide layouts at 1/4-inch scale. Provide details of ventilators, louvers, gutters, downspouts, and other sheet metal accessories at not less than 1-1/2-inch scale showing profiles, methods of joining, and anchorages.

D. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for metal roofing and siding panels with factory-applied finishes.

E. Samples for verification purposes of roofing and siding panels. Provide sample panels

12-inch long by actual panel width, in the profile, style, color, and texture indicated. Include clips, battens, fasteners, closures, and other panel accessories.

F. Installer certificates signed by metal building manufacturer written certification certifying that the installer complies with requirements included under the "Quality Assurance" Article.

G. Professional engineer's certificate prepared and signed by a Professional Engineer, legally authorized to practice in the jurisdiction where Project is located, verifying that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer to erect the pre-engineered metal building who has specialized in the erection and installation of types of metal buildings systems similar to that required for this project and who is certified in writing by the metal building system manufacturer as qualified for erection of the manufacturer's products.

B. Manufacturer's Qualifications: Provide pre-engineered metal buildings manufactured by a firm experienced in manufacturing metal buildings systems that are similar to those indicated for this project and have a record of successful in-service performance.

C. Single-Source Responsibility: Obtain the metal building system components, including structural framing, wall and roof covering, and accessory components, from one source from a single manufacturer.

D. Design Criteria: The drawings indicate sizes, profiles, and dimensional requirements of the pre-engineered metal building system. Metal building systems having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality is on the proposer.

E. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of the pre-engineered metal buildings and are based on the specific type and model indicated. Metal building systems having equal characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated components, sheets, panels, and other manufactured items so they

will not be damaged or deformed. Package wall and roof panels for protection against transportation damage.

B. Handling: Exercise care in unloading, storing, and erecting wall and roof covering panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

1.7 WARRANTY

A. Roofing and Siding Panel Finish Warranty: Furnish the roofing and siding panel manufacturer's written warranty, covering failure of the factory-applied exterior finish on metal wall and roof panels within the warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

4. Warranty period for factory-applied exterior finishes on wall and roof panels is 20 years after the date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Maintenance Stock: Furnish at least 5 percent excess over required amount of nuts, bolts, screws, washers, and other required fasteners for each metal building. Pack in cartons labeled to identify the contents and store on the site where directed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal building systems that may be incorporated in the work include but are not limited to the following:

B. Manufacturer: Subject to compliance with specified requirements, provide metal building systems provided by one of the following:

1. A & M Building Systems, Inc.
2. A & S Building Systems, Inc.

3. American Buildings Co.
4. American Steel Building Co., Inc.
5. Armco Steelox Building Systems.
6. Atlantic Building Systems.
7. Behlen Manufacturing Co.
8. Bigbee Steel Buildings, Inc.
9. Butler Manufacturing Co.
10. Ceco Buildings Division.
11. Chief Industries, Inc.
12. Dean Steel Buildings, Inc.
13. Garco Building Systems.
14. Gulf States Manufacturers, Inc.
15. Kirby Building Systems, Inc.
16. Mesco Metal Buildings Corp.
17. Package Steel Buildings Corp.
18. Pascoe Building Systems.
19. Southern Structures, Inc.
20. Space Master Buildings.
21. Star Buildings Division, H. H. Robertson Co.
22. United Structures of America.
23. Varco-Pruden Buildings.
24. Whirlwind Steel Buildings, Inc.

2.2 MATERIALS

A. Hot-Rolled Structural Steel Shapes: Comply with ASTM A 36 or A 529.

B. Steel Tubing or Pipe: Comply with ASTM A 500, Grade B, ASTM A 501, or ASTM A 53.

C. Steel Members Fabricated from Plate or Bar Stock: Provide 42,000 psi minimum yield strength. Comply with ASTM A 529, ASTM A 570, or ASTM A 572.

D. Steel Members Fabricated by Cold Forming: Comply with ASTM A 607, Grade 50.

E. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 366 or ASTM A 568.

F. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 568 or ASTM A 569.

G. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 446 with G90 coating complying with ASTM A 525. Grade to suit manufacturer's standards.

H. Commercial Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 526 with G60 coating complying with ASTM A 525.

I. Aluminum-Coated Steel Sheets: Comply with ASTM A 463 with T1-40 coating.

J. Aluminum Sheets: Comply with ASTM B 209 for Alclad alloy 3003 or 3004 with temper as required to suit forming operations.

K. Bolts for Structural Framing: Comply with ASTM A 307 or ASTM A 325 as necessary for design loads and connection details.

L. Glass and Glazing Materials: Provide glass complying with section 08800 Glazing.

M. Thermal Insulation: Glass fiber blanket insulation, complying with ASTM C 991, of 0.5 lb per cu. ft. density, thickness as indicated, with UL flame spread classification of 25 or less, and 2 inch wide continuous vapor-tight edge tabs.

1. Vapor Barrier: Vinyl film.
2. Retainer Strips: 26-gage (0.0179-inch) formed galvanized steel retainer clips colored to match the insulation facing.
3. R-19 all conditioned areas and R-11 at non-conditioned areas.

N. Paint and Coating Materials: Comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of federal specifications indicated is not required.

1. Shop Primer for Ferrous Metal: Fast-curing, lead-free, universal primer, selected by the manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-645.
2. Shop Primer for Ferrous Metal: Fast-curing, lead-free, abrasion- resistant, rust-inhibitive primer selected by the manufacturer for compatibility with substrates with types of alkyd finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with FS TT-P-86, Types I, II, or III.
3. Shop Primer for Galvanized Metal Surfaces: Zinc dust-zinc oxide primer selected by the manufacturer for compatibility with substrate. Comply with FS TT-P-641.
4. Shop Primer for Wood Surfaces: Alkyd primer as selected by the manufacturer for compatibility with the substrate. Comply with FS TT-P-25.

2.3 STRUCTURAL FRAMING

A. Rigid Frames: Fabricate from hot-rolled structural steel shapes. Provide factory-welded, shop-painted, built-up "I-beam"-shape or open-web-type frames consisting of tapered or

parallel flange beams and tapered columns. Furnish frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standard.

B. Primary Endwall Framing: Provide the following primary endwall framing members fabricated for field-bolted assembly:

1. Endwall Columns: Manufacturer's standard shop-painted, built-up factory-welded "I"-shape or cold-formed "C" sections, fabricated from 14-gage (0.0747-inch) steel.
2. Endwall Beams: Manufacturer's standard shop-painted "C"-shape roll-formed sections fabricated from 16-gage (0.0598-inch) steel.

C. Secondary Framing: Provide the following secondary framing members:

1. Roof Purlins, Sidewall and Endwall Girts: "C"-or "Z"-shaped sections fabricated from 16 gage (0.0598-inch) shop-painted roll-formed steel. Purlin spacers shall be fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
2. Eave Struts: Unequal flange "C"-shaped sections formed to provide adequate backup for both wall and roof panels. Fabricate from 16-gage (0.0598-inch) shop-painted roll-formed steel.
3. Flange and Sag Bracing: 1-5/8- by 1-5/8 inch angles fabricated from 16-gage (0.0598-inch) shop-painted roll-formed steel.
4. Base or Sill Angles: Fabricate from 14-gage (0.0747-inch) cold-formed galvanized steel sections.
5. Secondary endwall structural members, except columns and beams, shall be the manufacturer's standard sections fabricated from 14-gage (0.0747-inch) cold-formed galvanized steel.

D. Wind Bracing: Provide portal wind frames at four locations where indicated.

E. Bolts: Provide shop-painted bolts except when structural framing components are in direct contact with roofing and siding panels. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels.

F. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power-tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.

1. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer.

2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust-zinc oxide primer.

2.4 ROOFING AND SIDING PANELS

A. Face Sheets: Fabricate wall and roof panel face sheets to the profile or configuration indicated from 26-gage (0.0179-inch), structural quality, Grade C, zinc-coated steel sheets.

B. Face Sheets: Fabricate wall and roof panel face sheets to the profile or configuration indicated from 26-gage (0.00179-inch), drawing quality, aluminum-coated steel sheets.

C. Face Sheets: Fabricate wall and roof panel face sheets to the profile or configuration indicated from 0.032-inch-thick 3003 or 3004 Alclad alloy stucco embossed finish aluminum sheets.

D. Standing Seam Roof Panels: Manufacturer's standard factory-formed standing-seam roof panel system designed for mechanical attachment of panels to roof purlins using a concealed clip. Form panels of 26-gage (0.0179-inch), Grade C, zinc-coated steel sheets.

1. Clips: Provide 16-gage (0.0598-inch) panel clips.
2. Cleats: Factory-caulked, mechanically seamed cleats formed from 24-gage (0.0239-inch), Grade C, zinc-coated steel sheets.

E. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
2. Use aluminum or stainless steel fasteners for exterior application and galvanized or cadmium-plated fasteners for interior applications.
3. Locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.
4. Provide fasteners with heads matching color of roofing or siding sheets by means of plastic caps or factory-applied coating.

F. Accessories: Provide the following sheet metal accessories factory-formed of the same material in the same finish as roof and wall panels:

1. Flashings.
2. Closers.
3. Fillers.
4. Metal expansion joints.

5. Ridge covers.
6. Fascias.

G. Flexible Closure Strips: Closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or premold to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.

H. Sealing Tape: Pressure-sensitive 100 percent solids grey polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

I. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

J. Baked Enamel Finish: Provide the manufacturer's standard shop- applied baked enamel finish to galvanized steel roof and wall panels, and related trim and accessory elements. For roofing and siding, apply finish coat on exterior facings and manufacturer's standard wash coat on reverse face.

1. Clean galvanized steel with an alkaline compound, then treat with a zinc phosphate conversion coating, and seal with a chromic acid rinse.
2. Apply baked-on thermo-setting modified acrylic enamel to pretreated steel sheets, in one or more coats as standard with the manufacturer to achieve a minimum dry film thickness of 1.5 mils.

d. Color: As indicated by reference to the manufacturer's standard color designations.
e. Color: As selected by the Architect from the manufacturer's standard colors.

2.5 PERSONNEL DOORS

A. Materials: Fabricate personnel doors and frames from commercial quality, cold-rolled carbon steel sheet or commercial quality hot-rolled, pickled and oiled carbon steel sheet.

1. Zinc-coated Steel Sheets: Comply with ASTM A 526; with G60 coating complying with ASTM A 525, mill phosphatized.

B. Anchors and Accessories: Provide manufacturer's standard units. For items built into exterior walls, use galvanized units complying with ASTM A 153.

C. Doors: Provide doors of types and styles indicated on the drawings. Comply with SDI-100 for material quality, metal gages, and construction details.

1. Provide sightproof louvers for interior doors where indicated, constructed of

20-gage (0.0239-inch) steel V-shaped or Y-shaped blades, set into 18-gage (0.0359-inch) steel frame.

D. Frames: Provide frames of the types and sizes indicated. Comply with SDI-100 for material quality, metal gages, and construction details.

1. Provide standard hollow metal frames for doors, transoms, sidelights, borrowed lights, and other openings as indicated.
2. Prepare frames to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of frames for pairs of doors.

E. Fabrication: Fabricate units to be rigid, neat in appearance, and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.

F. Hardware: Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping. Comply with ANSI A115.

1. Reinforce to receive field-applied, surface-mounted finish hardware.
2. Locate finish hardware as indicated.
3. Locate finish hardware in accordance with "Recommended Locations for Builder's Hardware," published by the Door and Hardware Institute.
4. Provide hardware for each door leaf, as indicated on the drawing schedule(s) or if not indicated as follows:

a. Hinges: 1-1/2 pair, steel, template hinges, 4-1/2 inch by 4-1/2 inch.
b. Lockset: Cylindrical type, key in knob.
c. Threshold: Extruded aluminum (exterior doors only).
d. Silencers: Pneumatic rubber type for metal frames.

G. Shop-paint exposed surfaces, including galvanized surfaces, using manufacturer's standard baked-on rust-inhibitive primer.

2.6 OVERHEAD COILING DOORS

A. General: Provide complete overhead coiling door assemblies including door curtain, guides, counterbalance, hardware, operators, and installation accessories.

B. Performance Requirements: Provide doors certified to withstand a pressure and suction generated per Florida Building Code - Building 2010 with maximum deflection of 1/120 of the opening width.

C. Door Curtain: Interlocking steel slat door curtain with one-piece slats for the full length of door width. Form from 20-gage (0.0359-inch), Grade A, structural quality, zinc-coated

steel sheets. Phosphate treat before fabrication.

D. Endlocks: Provide endlocks fabricated from malleable iron castings, galvanized after fabrication, secured to curtain slats with galvanized rivets.

E. Windlocks: Provide windlocks fabricated from malleable iron castings, galvanized after fabrication, secured to curtain slats at 24 inches on center on both edges with galvanized rivets.

F. Bottom Bar: Provide bottom bar on door curtain consisting of two 1/8-inch-thick angles of the same metal as the door curtain slats. Provide flexible rubber, vinyl, or neoprene weather seal and cushion bumper on the bottom bar.

G. Curtain Jamb Guides: Provide curtain jamb guides, built up using steel angles, channels and flat bars complying with ASTM A 36. Galvanize after fabrication.

H. Weather Seals: 1/8-inch-thick continuous rubber or neoprene sheet weather seals on metal pressure bars secured to inside of curtain coil hood. At door jambs, use 1/8-inch-thick continuous strip secured to exterior side of jamb guide.

I. Counterbalance: Adjustable steel helical torsion spring counterbalance, mounted around a steel shaft in a spring barrel and connected to door curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

J. Brackets: Cast-iron or cold-rolled steel plate mounting brackets with bell-mouth guide groove for curtain.

K. Hood: Form to enclose the coiled curtain and operating mechanism entirely at the opening head and to act as a weather seal. Contour to suit end brackets to which attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods, and any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets to prevent sag.

1. Fabricate hoods for steel doors of 24-gage (0.0239-inch), zinc-coated steel sheet. Phosphate treat before fabrication.
2. Fabricate hoods for aluminum doors of Alloy 3003 aluminum sheet 0.032 inch thick, mill finish.

L. Shop Finish: Except for tightly joined and lubricated surfaces, shop-clean and prime ferrous and galvanized metal surfaces, both exposed and concealed, with the manufacturer's standard rust-inhibitive primer.

M. Chain Hoist Door Operators:

1. Chain Hoist Operation: Provide operator consisting of an endless cadmium-plated

alloy steel hand chain, chain pocket wheel and guard, and geared reduction unit with maximum 35-lb. pull for door operation. Design chain hoist with self-locking mechanism allowing curtain to be stopped at any point in its travel and to remain in that position until movement is reactivated. Furnish chain with chain holder secured to operator guide.

2.7 ALUMINUM WINDOWS

A. Aluminum Extrusions: Provide extrusions of alloy and temper recommended by the manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000 psi ultimate tensile strength and 0.062-inch thickness at any location for main frame and sash members. Comply with ASTM B 221.

1. Provide "Thermal-Break" construction. Separate frame and sash members exposed on the exterior from metal parts exposed on the interior by a continuous gasket or filler of rubber or plastic, locked into construction.
2. Mullions: Provide mullions between adjacent windows, fabricated of extruded aluminum matching the finish of window units.

B. Fasteners: Aluminum, nonmagnetic stainless steel, or other material warranted by the manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard noncorrosive pressed-in splined grommet nuts.
2. Provide exposed fasteners that match the finish of members and hardware being fastened.

C. Anchors, Clips, and Window Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with ASTM A 123.

D. Compression Glazing Strips and Weatherstripping: Molded neoprene gaskets complying with ASTM D 2000 designation 2BC415 to 3BC620, molded PVC gaskets complying with ASTM D 2287, or molded expanded neoprene gaskets complying with ASTM C 509, Grade 4.

E. Sliding Weatherstripping: Woven pile weatherstripping of wool, polypropylene or nylon pile and resin-impregnated backing fabric, and aluminum backing strip; comply with AAMA 701.

F. Sealants: Type recommended for joint size or movement, to remain permanently elastic, nonshrinking, and nonmigrating.

G. Insect Screens: Provide removable insect screen on each operable exterior sash, with finish matching window.

1. Wire Fabric Insect Screen: Stainless steel mesh, FS RR-W-365, Type VI, 18 by 18, 0.009-inch wire size.

H. Heavy Commercial Windows: Provide units complying with AAMA Grade and Performance Class HC40 for "Heavy Commercial" type buildings.

1. Design wind velocity at project site is indicated on the drawings. Comply with the code requirements for larger missile impact.

I. Window Types (Operation): Drawings indicate locations of operating sash, of the following types and grades:

1. Single-Hung Units: Comply with AAMA DH-HC40 for heavy commercial grade hung windows.
2. Aluminum Finish: Medium natural anodized, NAAMM AA-C22A31.

J. Preglazed Construction: To the greatest extent possible, glaze units at the shop prior to installation. See section 08800 Glazing for impact glazing requirements.

2.7 SHEET METAL ACCESSORIES

A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.

B. Gutters: Form in 8-foot-long sections, complete with end pieces, outlet tubes, and other special pieces as required. Size in accordance with SMACNA. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs. Furnish gutter supports spaced 36 inches on center, constructed of same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at outlets. Finish to match roof fascia and rake.

C. Downspouts: Form in 10-foot-long sections, complete with elbows and offsets. Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 5 feet on center in between. Finish to match wall panels.

D. Wall Louvers: Provide louvers, size and design indicated, of 18-gage (0.0478-inch) steel. Fold or bead blades at edges, set at an angle that excludes driving rains, and secure to frames by riveting or welding. Finish to match wall panels.

1. Provide vertical mullions for louvers 4 feet and more in width, with one mullion for

each 4 feet of width.

2. Provide flanges on interior face of frames where air intake or exhaust louvers are indicated to be connected with mechanically operated dampers or metal ductwork.
3. Provide 1/2-inch by 1/2-inch galvanized steel mesh bird screens in rewirable frames on exterior face of louvers. Secure with clips to ensure ease of removal for cleaning and rewiring. Fabricate screens and frames of same type metal as louvers.

2.8 FABRICATION

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.

1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount of labor.
2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

B. Structural Framing: Shop-fabricate framing components to indicated size and section with base plates, bearing plates, and other plates required for erection, welded in place. Provide holes for anchoring or connections shop-drilled or punched to template dimensions.

1. Shop Connections: Provide power riveted, bolted, or welded shop connections.
2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.1 ERECTION

A. Framing: Erect framing true to line, level, plumb, rigid, and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a nonshrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.

B. Purlins and Girts: Provide rake or gable purlins with tight-fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.

C. Bracing: Provide diagonal rod or angle bracing in roof as required.

1. Movement-resisting frames shall be used in lieu of sidewall rod bracing.

2. Where diaphragm strength of roof or wall covering is adequate to resist wind forces, bracing will not be required.

D. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.2 ROOFING AND SIDING

A. General: Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.

1. Field cutting of exterior panels by torch is not permitted.
2. Provide weatherseal under ridge cap. Flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.

B. Standing-Seam Roof Panel System: Fasten roof panels to purlins with concealed clip in accordance with the manufacturer's instructions.

1. Install clips at each support with self-drilling fasteners.
2. At end laps of panels, install tape calk between panels.
3. Install factory-caulked cleats at standing-seam joints. Machine-seam cleats to the panels to provide a weathertight joint.

C. Wall Sheets: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's recommendations.

1. Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. Fasten window and door frames with machine screws or bolts. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

D. Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

E. Hollow Metal Doors and Frames: Install doors and frames straight, plumb, and level. Securely anchor frames to building structure. Set units with 1/8-inch maximum clearance between door and frame at jambs and head and 3/4-inch maximum between door and floor. Adjust hardware for proper operation.

F. Overhead Coiling Doors: Set doors and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports in accordance with manufacturer's instructions. Adjust moving hardware for proper operation.

G. Windows: Anchor windows securely in place. Seal perimeter of each unit with the elastomeric sealant used for panels. Adjust and lubricate operating sash and hardware for proper operation. Clean surfaces of window units. Mount screens direct to frames with tapped screw clips.

H. Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Do not install glass that has significant edge damage or other defects.

1. Install setting blocks at quarter points, set in a bed of sealant if heel-bead is used. Install spacers inside and out, all around, wherever liquid or plastic/mastic compounds are used, except on glass sizes smaller than 50 united inches.
2. Replace glass that is broken or damaged prior to the time of acceptance. Each piece of exterior glass must be airtight and watertight through normal weather/temperature cycles and through normal door/window operation.

I. Thermal Insulation: Install insulation concurrently with installation of roof panels in accordance with manufacturer's directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on underside of roof sheets, extending across the top flange of purlin members and held taut and snug to roofing panels with retainer clips. Install retainer strips at each longitudinal joint, straight and taut, nesting with roof rib to hold insulation in place.

J. Cleaning and Touch-Up: Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects to shop-primed surfaces with same type material as shop primer.

END OF SECTION 13122

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Fire-suppression equipment and piping demolition.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Concrete bases.
10. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Mechanical sleeve seals.
2. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

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

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

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

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining CPVC Plastic Piping: ASTM F493.

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated .

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated .

E. One-Piece, Stamped-Steel Type: With spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

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

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

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

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

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

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

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

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

J. Install piping to allow application of insulation.

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

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    i. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    j. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor

level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    a. Steel Pipe Sleeves: For pipes smaller than.
    b. Steel Sheet Sleeves: For pipes 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 above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
        1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than in diameter.
2. Install cast-iron "wall pipes" for sleeves and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop

materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D2846 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D3139.

3.3 PAINTING

A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section Cast-in-Place Concrete."

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

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

B. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression 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 GROUTING

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 211313
WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Manual control stations.
7. Control panels.
8. Pressure gages.

1.2 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.3 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

B. Deluge Sprinkler System: Open sprinklers are attached to piping connected to water supply through deluge valve. Fire-detection system, in same area as sprinklers, opens valve. Water flows into piping system and discharges from attached sprinklers when valve opens.

1.4 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175 psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Available fire-hydrant flow test records indicate the following conditions:
    a. Date: 2-28-2012
    b. Performed by: City of Naples Fire Department.
    c. Location of Residual Fire Hydrant R: Citation Point
    d. Location of Flow Fire Hydrant F: Citation Point
    e. Static Pressure at Residual Fire Hydrant R: 75 psig.
    f. Measured Total Flow at Flow Fire Hydrant F: 1088 gpm.
    g. Residual Pressure at Residual Fire Hydrant R: 55 psig.
    h. Fire Flow: 1879 gpm available @ 20 psi

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 5 percent, including losses through water-service piping, valves, and backflow preventers.
2. Minimum Density for Automatic-Sprinkler Piping Design:
    Refer to plans for areas of protection
3. Maximum Protection Area per Sprinkler: Per UL listing.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Compressed air piping.
3. HVAC hydronic piping.
4. Items penetrating finished ceiling include the following:
    a. Lighting fixtures.

E. Qualification Data: For qualified Installer and professional engineer.

F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

G. Fire-hydrant flow test report.

H. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

I. Field quality-control reports.

J. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

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

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

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.7 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

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

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized- and Black-Steel Pipe: ASTM A53, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A135 or ASTM A795, Schedule 10 in 5 inches and smaller; and NFPA 13-specified wall thickness in 6 to 10 inches, plain end.

C. Galvanized- and Black-Steel Pipe Nipples: ASTM A733, made of ASTM A53, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized and Uncoated, Steel Couplings: ASTM A865, threaded.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

H. Steel Welding Fittings: ASTM A234 and ASME B16.9.

I. Grooved-Joint, Steel-Pipe Appurtenances:

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. Anvil International, Inc.
    b. Corcoran Piping System Co.
    c. National Fittings, Inc.
    d. Shurjoint Piping Products.
    e. Tyco Fire & Building Products LP.
    f. Victaulic Company.
2. Pressure Rating: 175 psig minimum.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A47, malleable-iron casting or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

J. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175 psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

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. Victaulic Company.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic and asbestos free.

1. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ringtype gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

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

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Anvil International, Inc.
    b. Victaulic Company.
2. Standard: UL 1091 except with ball instead of disc.
3. Valves 2 inch and smaller: Bronze body with threaded ends.
4. Valves 3 inch and larger: Bronze body with threaded ends or ductile-iron body with grooved ends.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. AFAC Inc.
    b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    c. Anvil International, Inc.
    d. Clow Valve Company; a division of McWane, Inc.
    e. Crane Co.; Crane Valve Group; Crane Valves.
    f. Crane Co.; Crane Valve Group; Jenkins Valves.
    g. Crane Co.; Crane Valve Group; Stockham Division.
    h. Fire-End & Croker Corporation.
    i. Fire Protection Products, Inc.
    j. Fivalco Inc.
    k. Globe Fire Sprinkler Corporation.
    l. Groeniger & Company.
    m. Kennedy Valve; a division of McWane, Inc.
    n. Matco-Norca.
    o. Metraflex, Inc.
    p. Milwaukee Valve Company.
    q. Mueller Co.; Water Products Division.
    r. NIBCO INC.
    s. Potter Roemer.
    t. Reliable Automatic Sprinkler Co., Inc.
    u. Shurjoint Piping Products.

v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.
aa. Watts Water Technologies, Inc.

2. Standard: UL 312.
3. Pressure Rating: 175 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

D. Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. United Brass Works, Inc.
2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded.

E. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. American Valve, Inc.
   c. Clow Valve Company; a division of McWane, Inc.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Kennedy Valve; a division of McWane, Inc.
   f. Mueller Co.; Water Products Division.
   g. NIBCO INC.
   h. Tyco Fire & Building Products LP.
2. Standard: UL 262.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

F. Indicator Posts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    b. American Valve, Inc.
    c. Clow Valve Company; a division of McWane, Inc.
    d. Crane Co.; Crane Valve Group; Stockham Division.
    e. Kennedy Valve; a division of McWane, Inc.
    f. Mueller Co.; Water Products Division.
    g. NIBCO INC.
    h. Tyco Fire & Building Products LP.
2. Standard: UL 789.
3. Type: Horizontal for wall mounting.
4. Body Material: Cast iron with extension rod and locking device.
5. Operation: Wrench.

2.7 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Fire Protection Products, Inc.
    b. United Brass Works, Inc.

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Affiliated Distributors.
    b. Anvil International, Inc.
    c. Barnett.
    d. Conbraco Industries, Inc.; Apollo Valves.
    e. Fire-End & Croker Corporation.

f. Fire Protection Products, Inc.
g. Flowserve.
h. FNW.
i. Jomar International, Ltd.
j. Kennedy Valve; a division of McWane, Inc.
k. Kitz Corporation.
l. Legend Valve.
m. Metso Automation USA Inc.
n. Milwaukee Valve Company.
o. NIBCO INC.
p. Potter Roemer.
q. Red-White Valve Corporation.
r. Southern Manufacturing Group.
s. Stewart, M. A. and Sons Ltd.
t. Tyco Fire & Building Products LP.
u. Victaulic Company.
v. Watts Water Technologies, Inc.

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Fire Protection Products, Inc.
    b. United Brass Works, Inc.

E. Plug Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: Southern Manufacturing Group.

2.8 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
    a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. AFAC Inc.
    b. Globe Fire Sprinkler Corporation.
    c. Reliable Automatic Sprinkler Co., Inc.
    d. Tyco Fire & Building Products LP.
    e. Venus Fire Protection Ltd.
    f. Victaulic Company.
    g. Viking Corporation.
2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. AFAC Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: 3/4
6. End Connections: Threaded.

2.9 FIRE-DEPARTMENT CONNECTIONS

A. Exposed-Type, Fire-Department Connection:

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. AFAC Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. Fire-End & Croker Corporation.
    d. Fire Protection Products, Inc.
    e. GMR International Equipment Corporation.

f. Guardian Fire Equipment, Inc.
g. Tyco Fire & Building Products LP.

2. Standard: UL 405.
3. Type: Exposed, projecting, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Round, brass, wall type.
9. Outlet: Back, with pipe threads.
10. Number of Inlets: Two.
11. Escutcheon Plate Marking: Similar to " AUTO SPKR."
12. Finish: Rough brass or bronze.
13. Outlet Size: 2-1/2 inches.

2.10 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

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. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.
2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

B. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. AGF Manufacturing Inc.
    b. Triple R Specialty.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.

e. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Adjustable Drop Nipples:

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. CECA, LLC.
   b. Corcoran Piping System Co.
   c. Merit Manufacturing; a division of Anvil International, Inc.
2. Standard: UL 1474.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.12 SPRINKLERS

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. AFAC Inc.
2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.

2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

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. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco Fire & Building Products LP.
    c. Victaulic Company.
    d. Viking Corporation.
2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.14 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

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. Globe Fire Sprinkler Corporation.

b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.

2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10 inches diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: 3/4 inch.
8. Outlet: 1 inch drain connection.

C. Water-Flow Indicators:

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. ADT Security Services, Inc.
    b. McDonnell & Miller; ITT Industries.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.
    e. Viking Corporation.
    f. Watts Industries (Canada) Inc.
2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factoryset, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

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. Fire-Lite Alarms, Inc.; a Honeywell company.
    b. Kennedy Valve; a division of McWane, Inc.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.
2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.

5. Design: Signals that controlled valve is in other than fully open position.

2.15 PRESSURE GAGES

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. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3 1/2 to 4 1/2 inch diameter.

D. Pressure Gage Range: 0 to 250 psig.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

2.16 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with spring clips.

E. Split-Casting, Cast-Brass Escutcheons: Polished chrome-plated finish with concealed hinge and set-screw.

F. Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge, spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.17 SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

C. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

D. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.

2.18 SLEEVE SEALS

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. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building.

B. Install shutoff valve, check valve, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.4 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

D. Install unions adjacent to each valve in pipes 3 inch and smaller.

E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 4 inch and larger end connections.

F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

G. Install sprinkler piping with drains for complete system drainage.

H. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve.

I. Install alarm devices in piping systems.

J. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

K. Install pressure gages on riser or feed main, at each sprinkler test connection. Include pressure gages with connection not less than 1/2 inch and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

L. Fill sprinkler system piping with water.

3.5 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes 3 inch and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 4 inch and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.7 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.8 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install yard mounted, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.9 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.

3. Bare Piping at Ceiling Penetrations in Finished Spaces: Split casting, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, stamped steel with spring clips.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.10 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4 inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical

Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
a. Extend sleeves 2 inches above finished floor level.
3. Sleeves for Piping Passing through Gypsum-Board Partitions:
a. Galvanized-steel-pipe sleeves for pipes smaller than 6 inches.
b. Galvanized-steel-sheet sleeves for pipes 6 inches and larger.
c. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
4. Sleeves for Piping Passing through Exterior Concrete Walls:
a. Galvanized-steel-pipe sleeves for pipes smaller than 6 inches.
b. Cast-iron wall-pipe sleeves for pipes6 inches and larger.
c. Install sleeves that are large enough to provide 1 inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
5. Sleeves for Piping Passing through Interior Concrete Walls:
a. Galvanized-steel-pipe sleeves for pipes smaller than 6 inches.
b. Galvanized-steel-sheet sleeves for pipes 6 inches and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.11 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.14 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.15 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain.

3.16 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control vales, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, 2 inches and smaller, shall be the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight , galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. CPVC piping equal to “Blazemaster” may be used in light hazard occupancies where concealed by non-combustible construction.

D. Standard-pressure, wet-pipe sprinkler system, 2 1/2 to 6 inches, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Standard-weight , black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Standard-weight, galvanized-steel pipe with roll-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.17 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright and pendent sprinklers.
2. Rooms with Suspended Ceilings: Recessed sprinklers.
3. Wall Mounting: Sidewall sprinklers.
4. Use Ordinary Temperature rated sprinklers (as defined by N.F.P.A. 13) in all locations within building. Use Intermediate Temperature rated sprinklers for attic and unconditioned spaces.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
2. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes (waste storage areas).

END OF SECTION

SECTION 220500

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Escutcheons.
6. Equipment installation requirements common to equipment sections.
7. Concrete bases.
8. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Escutcheons.

1.4 QUALITY ASSURANCE

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

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

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

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

C. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D2564. Include primer according to ASTM F656.

2.4 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Unions: MSS SP-107, PVC 4-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers: NIBCO, Inc.; Chemical Division.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:
    a. Capitol Manufacturing Co.
    b. Central Plastics Company.
    c. Eclipse, Inc.
    d. Epco Sales, Inc.
    e. Hart Industries, International, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Industries, Inc.; Wilkins Div.

2.6 SLEEVES

A. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

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

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

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

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

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

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

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

J. Install piping to allow application of insulation.

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

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

N. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

O. Verify final equipment locations for roughing-in.

P. Refer to equipment specifications in other Sections of these Specifications for roughing in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

E. 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.

F. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D2855.

G. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting,

with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

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

B. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

END OF SECTION

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following general-duty valves:

1. Copper-alloy ball valves.
2. Bronze gate valves.

B. Related Section includes the following: Division 22 Section “Identification for Plumbing Piping and Equipment” for valve tags and charts.

1.2 DEFINITIONS

A. The following are standard abbreviations for valves:

1. CWP: Cold working pressure.
2. PTFE: Polytetrafluoroethylene plastic.
3. TFE: Tetrafluoroethylene plastic.

1.3 SUBMITTALS

A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.4 QUALITY ASSURANCE

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

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 angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES, GENERAL

A. Refer to Part 3 "Valve Applications" Article for applications of valves.

B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.

C. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.

F. Valve Actuators:

1. Handwheel: For valves other than quarter-turn types.
2. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.

G. Extended Valve Stems: On insulated valves.

H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.

I. Valve Grooved Ends: AWWA C606.

1. Solder Joint: With sockets according to ASME B16.18.
    a. Caution: Use solder with melting point below 840 degF for angle, check, gate, and globe valves; below 421 degF for ball valves.
2. Threaded: With threads according to ASME B1.20.1.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

A. Manufacturers:

1. Two-Piece, Copper-Alloy Ball Valves:
    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Grinnell Corporation.
    c. Hammond Valve.
    d. Jamesbury, Inc.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. Watts Industries, Inc.; Water Products Div.

B. Copper-Alloy Ball Valves, General: MSS SP-110.

C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze, forged-brass, bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig minimum CWP rating and blowout-proof stem.

2.4 BRONZE GATE VALVES

A. Manufacturers:

1. Type 1, Bronze, Nonrising-Stem Gate Valves:
    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Hammond Valve.
    c. NIBCO INC.
    d. Powell, Wm. Co.
    e. Watts Industries, Inc.; Water Products Div.

B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.

C. Type 1, Class 125, Bronze Gate Valves: Bronze body with nonrising stem and bronze solid wedge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.

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

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or gate valves.
2. Throttling Service: Angle, ball, butterfly, or globe valves.
3. Pump Discharge: Spring-loaded, lift-disc check valves.

B. If valves with specified CWP ratings are not available, the same types of valves with higher CWP ratings may be substituted.

C. Domestic Water Piping: Use the following types of valves:

1. Ball Valves, NPS 2 and Smaller: 2-piece, 400-psig CWP rating, copper alloy.
2. Gate Valves, NPS 2 and Smaller: Type 1, Class 125, bronze.

D. Select valves, except wafer and flangeless types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Solder-joint or threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded ends.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.3 VALVE INSTALLATION

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement.

3.4 JOINT CONSTRUCTION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for basic piping joint construction.

B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Soldered Joints: Use ASTM B813, water-flushable, lead-free flux; ASTM B32, lead-free-alloy solder; and ASTM B828 procedure, unless otherwise indicated.

3.5 ADJUSTING

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

END OF SECTION

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Equipment supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

1.4 QUALITY ASSURANCE

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

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

C. Nonmetallic Coatings: Plastic coating, jacket, or liner.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Insulation-Insert Material for Hot Piping: ASTM C552, Type II cellular glass.

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

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

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

2.3 EQUIPMENT SUPPORTS

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

2.4 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

E. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install lateral bracing with pipe hangers and supports to prevent swaying.

G. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

I. Insulated Piping: Comply with the following:

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

b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

4. Pipes NPS 8 and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for 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 shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 Painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.2 SUBMITTALS

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

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.

5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11- inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semi-rigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:
    a. Background Color: Green.
    b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
    a. Cold Water: 2 inches, round.
    b. Hot Water: 2 inches, round.
2. Valve-Tag Color:
    a. Cold Water: Green.
    b. Hot Water: Green.
3. Letter Color:
    a. Cold Water: Black.
    b. Hot Water: Black.

END OF SECTION

SECTION 220700
PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
    a. Flexible elastomeric.
    b. Mineral fiber.
2. Adhesives.
3. Sealants.
4. Field-applied jackets.

B. Related Section includes the following: Division 23 Section “HVAC Insulation”.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.3 QUALITY ASSURANCE

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

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test response characteristics indicated, as determined by testing identical products per ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 COORDINATION

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

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

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

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

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Fibrex Insulations Inc.; Coreplus 1200.
    b. Johns Manville; Micro-Lok.
    c. Knauf Insulation; 1000(Pipe Insulation.
    d. Manson Insulation Inc.; Alley-K.
    e. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 degF Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Dow Chemical Company (The); 739, Dow Silicone.
    b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Speedline Corporation; Speedline Vinyl Adhesive.

2.3 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 degF.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 GENERAL INSTALLATION REQUIREMENTS

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

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

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the

thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend

insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

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

B. Insulation Installation on Pipe Flanges:

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

C. Insulation Installation on Pipe Fittings and Elbows:

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

D. Insulation Installation on Valves and Pipe Specialties:

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

3.8 FIELD-APPLIED JACKET INSTALLATION

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

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

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

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

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

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

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

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.

3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inchcircumference limit allows for 2-inch-overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.9 FINISHES

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

1. Flat Acrylic Finish: 2 finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
    a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

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

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

3.10 PIPING INSULATION SCHEDULE, GENERAL

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

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

1. Drainage piping located in crawl spaces.

2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
    a. Flexible Elastomeric: 3/4 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
    a. Flexible Elastomeric: 1 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

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

1. All Pipe Sizes: Insulation shall be one of the following:
    a. Flexible Elastomeric: 3/4 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION

SECTION 221116
DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Flexible connectors.
3. Escutcheons.
4. Sleeves and sleeve seals.

1.2 SUBMITTALS

A. Product Data: For the following products:

1. Flexible connectors.
2. Domestic water pipes.
3. Escutcheons.
4. Sleeves and sleeve seals.

1.3 QUALITY ASSURANCE

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

B. Comply with NSF 61 for potable domestic water piping and components.

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 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B88, Type L water tube, drawn temper.

1. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

2. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
3. Copper Pressure-Seal-Joint Fittings:
    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) Elkhart Products Corporation; Industrial Division.
        2) NIBCO INC.
    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM rubber O-ring seal in each end.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Solder: ASTM B32, Alloy Sn95, Sn94, or E; lead free.

2.4 FLEXIBLE CONNECTORS

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

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Flex Pression, Ltd.
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Rubber Co.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. Tozen Corporation.
10. Unaflex, Inc.
11. Universal Metal Hose; a Hyspan company

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.

3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Stamped Steel: Chrome-plated finish with spring clips.

2.6 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A53, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2.7 SLEEVE SEALS

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. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

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

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

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

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure reducing valves.

F. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

G. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

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

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping adjacent to equipment and specialties to allow service and maintenance.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

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

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

R. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.2 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 FLEXIBLE CONNECTOR INSTALLATION

A. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with

requirements in Division 22 plumbing fixture Sections for connection sizes.

3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.6 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

3.7 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.

2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.
    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
3. Sleeves for Piping Passing through Gypsum-Board Partitions:
    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:
    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
    d. Do not use sleeves when wall penetration systems are used.
6. Sleeves for Piping Passing through Interior Concrete Walls:
    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.8 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.9 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.10 ADJUSTING

A. Perform the following adjustments before 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. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:
        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on above-ground copper tubing.

D. Above-ground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

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

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221119
DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Temperature-actuated water mixing valves.
3. Hose bibbs.
4. Drain valves.
5. Water hammer arresters.
6. Trap-seal primer valves.

B. Related Sections include the following:

1. Division 22 Sections for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 22 Section "Domestic Water Piping" for water meters.
3. Division 22 Sections for water filters in domestic water piping.
4. Division 22 Section "Emergency Plumbing Fixtures" for water tempering equipment.
5. Division 22 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

1.2 PERFORMANCE REQUIREMENTS

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

1.3 SUBMITTALS

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

B. Field quality-control test reports.

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

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. MIFAB, Inc.
    b. Watts Industries, Inc.; Water Products Div.
    c. Woodford Manufacturing Company.
    d. Zurn Plumbing Products Group; Light Commercial Operation.
2. Standard: ASSE 1011.
3. Body: Bronze, non-removable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Rough bronze.

2.2 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
    a. Leonard Valve Company.
    b. Powers; a Watts Industries Co.
    c. Symmons Industries, Inc.
    d. Watts Industries, Inc.; Water Products Div.
    e. Zurn Plumbing Products Group; Wilkins Div.

2.3 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.

7. Vacuum Breaker: Integral, non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.

2.4 DRAIN VALVES

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

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.5 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. PPP Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products Inc.
    i. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.6 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. MIFAB, Inc.
    b. PPP Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
3. Size: NPS 1-1/4 minimum.
4. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install water control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

D. Install water hammer arresters in water piping according to PDI-WH 201.

E. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

F. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment name-plate or sign on or near each of the following: Supply type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

SECTION 221316
SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building: Pipe, tube, and fittings.

1.2 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

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 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

1.5 QUALITY ASSURANCE

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and de-aerator drainage fittings.

C. Shielded Couplings: ASTM C1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C564, rubber sleeve.
    a. Manufacturers:
        1) ANACO.
        2) Fernco, Inc.
        3) Ideal Div.; Stant Corp.
        4) Mission Rubber Co.
        5) Tyler Pipe; Soil Pipe Div.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D2665, socket type, made to ASTM D3311, drain, waste, and vent patterns.

B. Solvent Cement and Adhesive Primer:

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Above-ground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. 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."

D. 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 2 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.

E. 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.

F. Install engineered soil and waste drainage and vent piping systems as follows:

1. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-ongrade if slab is without membrane waterproofing.

H. Install PVC soil and waste drainage and vent piping according to ASTM D2665.

I. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

C. PVC Nonpressure Piping Joints: Join piping according to ASTM D2665.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General- Duty Valves for Plumbing Piping."

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Install individual, straight, horizontal piping runs according to the following:
    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for 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 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

H. Install supports for vertical PVC piping every 48 inches.

I. 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 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. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 221319
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Trench drains.
4. Roof flashing assemblies.

1.2 QUALITY ASSURANCE

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

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

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

1.3 COORDINATION

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

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide a product by J.R. Smith, Model 4710, or a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. Oatey.

c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Light Commercial Operation.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Light Commercial Operation.

2.3 TRENCH DRAINS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Model Z882, 12 inch wide trench drain system of High Density Polyethylene (HDPE) with Trench No. 8201, with E4, 4 inch end outlet and Ductile Iron Grate, DGC, Class C rated or a comparable product by one of the following:

1. Josam Company; Josam Div.
2. MIFAB, Inc.
3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Subject to compliance with requirements, provide products by one of the following:
    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install wood-blocking reinforcement for wall-mounting-type specialties.

H. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

I. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 223300
ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following electric water heaters:

1. Light-commercial electric water heaters.
2. Compression tanks.
3. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated.

C. 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.

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/ IESNA 90.1-2004.

E. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures including storage tank and supports.
    b. Faulty operation of controls.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period(s): From date of Substantial Completion:
    a. Light-Commercial Electric Water Heaters:
        1) Storage Tank: 5 years.
        2) Controls and Other Components: 2 years.
    b. Compression Tanks: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 for household, storage electric water heaters.

1. Manufacturers:
    a. Bradford White Corporation.
    b. Lochinvar Corporation.
    c. Ruud Water Heater Div.; Rheem Manufacturing Company.
    d. Smith, A. O. Water Products Company.
    e. State Industries, Inc.
2. Storage-Tank Construction: Steel, vertical arrangement.
    a. Tappings: ASME B1.20.1 pipe thread.
    b. Pressure Rating: 150 psig.
    c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1-2004 or ASHRAE 90.2- 2004.
e. Jacket: Steel with enameled finish.
f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.
j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics:
a. Capacity: 40 gal.
b. Heating Elements: 4.5 kilowatt each.
c. Temperature Setting: 120 deg F.
d. Electrical Characteristics:
1) Power Demand:
2) Volts: 208.
3) Phases: Single.
4) Hertz: 60.

2.3 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air pre-charge to minimum system-operating pressure at tank.

1. Manufacturers:
a. AMTROL Inc.
b. Smith, A. O.; Aqua-Air Div.
c. State Industries, Inc.
d. Taco, Inc.
2. Construction:
a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics:

a. Working-Pressure Rating: 100 psig.

b. Capacity Acceptable: 4 gal. minimum.

2.4 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

C. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

2.5 SOURCE QUALITY CONTROL

A. Hydrostatically testwater heater storage tanks before shipment to minimum of one and one-half times pressure rating.

B. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

B. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

C. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to

Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

D. Fill water heaters with water.

E. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories, showers and sinks.
2. Toilet seats.
3. Fixture supports.
4. Water closets.
5. Lavatories.
6. Service basins.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

F. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Mop-Service Basins: ANSI Z124.6.
3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
4. Vitreous-China Fixtures: ASME A112.19.2M.
5. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.

7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Supply Fittings: ASME A112.18.1.
11. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Deck-Mounted Bath/Shower Transfer Valves: ASME 18.7.
4. Faucets: ASME A112.18.1.
5. Hand-Held Showers: ASSE 1014.
6. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Manual-Control Antiscald Faucets: ASTM F444.
9. Pipe Threads: ASME B1.20.1.
10. Pressure-Equalizing-Control Antiscald Faucets: ASTM F444 and ASSE 1016.
11. Thermostatic-Control Antiscald Faucets: ASTM F444 and ASSE 1016.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Plastic Tubular Fittings: ASTM F409.
5. Brass Waste Fittings: ASME A112.18.2.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Floor Drains: ASME A112.6.3.
3. Grab Bars: ASTM F446.
4. Hose-Coupling Threads: ASME B1.20.7.
5. Off-Floor Fixture Supports: ASME A112.6.1M.
6. Pipe Threads: ASME B1.20.1.
7. Plastic Toilet Seats: ANSI Z124.5.

1.5 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Structural failures of unit shell.
    b. Faulty operation of controls, blowers, pumps, heaters, and timers.
    c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Period for Commercial Applications: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIXTURE SUPPORTS

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

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Lavatory Support
1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.2 WATER CLOSETS

A. Water Closets:

1. Basis-of-Design Product: Subject to compliance with requirements, provide specified item or a comparable product by one of the following:
    a. American Standard Companies, Inc.
    b. Kohler Co.

2.7 LAVATORIES

A. Lavatories and Sinks:

1. Basis-of-Design Product: Subject to compliance with requirements, provide specified item or a comparable product by one of the following:
    a. American Standard Companies, Inc.
    b. Kohler Co.
    c. Fixture Support: Lavatory P-2.

2.8 SERVICE BASIN

A. Service Basins:

1. Basis-of-Design Product: Subject to compliance with requirements, provide specified item or a comparable product by one of the following:
    a. Acorn Engineering Company.
    b. Crane Plumbing, L.L.C./Fiat Products.
    c. Florestone Products Co., Inc.
    d. Precast Terrazzo Enterprises, Inc.
    e. Stern-Williams Co., Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

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

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

D. Install wall-mounting fixtures with tubular waste piping attached to supports.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball or gate valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

K. Install toilet seats on water closets.

L. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

M. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

N. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

O. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

P. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if

required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

Q. Set service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

R. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 224500
EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following emergency plumbing fixtures: Combination units.

1.2 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Self-Contained Emergency Plumbing Fixture: Fixture with flushing-fluid-solution supply.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

B. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.

C. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 COMBINATION UNITS

A. Combination Units:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Barrier-Free, Haws Model No. 8300.158WC with Model No. 9001 Emergency alarm and light or a comparable product by one of the following:
    a. Bradley Corporation.
    b. Guardian Equipment Co.
    c. Western Emergency Equipment.

2.2 SOURCE QUALITY CONTROL

A. Certify performance of plumbed emergency plumbing fixtures by independent testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

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

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."

E. Install escutcheons on piping wall and ceiling penetrations in exposed, finished

locations. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

F. Install equipment markers on fixtures and equipment signs. Identification materials are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect cold-water-supply piping to plumbed emergency plumbing fixtures not having water-tempering equipment.

3.4 FIELD QUALITY CONTROL

A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities.

B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

C. Report test results in writing.

3.5 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

END OF SECTION

SECTION 224700

DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following water coolers and related components:

1. Pressure water coolers.
2. Fixture supports.

1.2 DEFINITIONS

A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of fixture.

C. Fixture: Drinking fountain or water cooler unless one is specifically indicated.

D. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.3 SUBMITTALS

A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.

B. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

1.4 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. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act" ; and Public Law 101-336, "Americans with Disabilities Act" ; for fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

E. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Water Coolers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide specified product or a comparable product by one of the following:
    a. Elkay Manufacturing Co.
    b. Halsey Taylor.
    c. Haws Corporation.
    d. Oasis Corporation.
    e. Sunroc Corp.

2.2 FIXTURE SUPPORTS

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

1. Josam Co.
2. MIFAB Manufacturing, Inc.
3. Smith, Jay R. Mfg. Co.
4. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
5. Zurn Plumbing Products Group; Specification Drainage Operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

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

3.2 APPLICATIONS

A. Use carrier off-floor supports for wall-mounting fixtures, unless otherwise indicated.

B. Use chrome-plated brass or copper tube, fittings, and valves in locations exposed to view. Plain copper tube, fittings, and valves may be used in concealed locations.

3.3 INSTALLATION

A. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

B. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install pipe escutcheons at wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding pipe fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

F. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

1. Remove and replace malfunctioning units and retest as specified above.
2. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust water cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION

SECTION 230500

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.4 QUALITY ASSURANCE

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

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

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

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

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

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

C. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturer: Eslon Thermoplastics.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:
    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

D. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermo-plastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:
    a. Calpico, Inc.
    b. Lochinvar Corp.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Available Manufacturers:
    a. Advance Products & Systems, Inc.

b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Plastic or Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.

B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

2.9 GROUT

A. Description: ASTM C1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

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

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

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

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

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

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

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

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

J. Install piping to allow application of insulation.

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

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.5 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

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

B. Field Welding: Comply with AWS D1.1.

3.8 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 degC and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Capacitor start, inductor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 230529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

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

B. Related Section includes the following: Division 23 Sections for duct hangers and supports.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.
3. Globe Pipe Hanger Products, Inc.
4. Grinnell Corp.
5. National Pipe Hanger Corporation.
6. PHD Manufacturing, Inc.
7. PHS Industries, Inc.
8. Piping Technology & Products, Inc.
9. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

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

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.

2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Power-Strut Div.; Tyco International, Ltd.
4. Thomas & Betts Corporation.
5. Tolco Inc.
6. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C533, Type I calcium silicate or ASTM C552, Type II cellular glass.

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

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

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

2.6 FASTENER SYSTEMS

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

1. Available Manufacturers:
    a. B-Line Systems, Inc.; a division of Cooper Industries.
    b. Hilti, Inc.
    c. ITW Ramset/Red Head.
    d. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

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

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS ½ to NPS 24, if little or no insulation is required.
3. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated stationary pipes, NPS 3/4 to NPS 8.
4. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 2.
5. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 degF piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 degF piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. C-Clamps (MSS Type 23): For structural shapes.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
2. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A36, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 Painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Equipment labels.

1.2 SUBMITTALS

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

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

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

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems: Constant-volume air systems.
2. Reporting results of activities and procedures specified in this Section.

1.2 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

F. Report Forms: Test data sheets for recording test data in logical order.

G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

H. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

I. TAB: Testing, adjusting, and balancing.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of systems or equipment.

L. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.3 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Strategies and Procedures Plan: Within 90 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

C. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

D. Sample Report Forms: Submit two sets of sample TAB report forms.

1.4 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's " Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, " Required Instrumentation for NEBB Certification."

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems—Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine strainers for clean screens and proper perforations.

N. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

O. Examine system pumps to ensure absence of entrained air in the suction piping.

P. Examine equipment for installation and for properly operating safety interlocks and controls.

Q. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.

5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of p procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:
    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors.

Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
    a. Where sufficient space in submain and branch ducts is unavailable for Pitottube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.

3.8 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.

2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.

2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.
5. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
    j. Number of belts, make, and size.
    k. Number of filters, type, and size.
2. Motor Data:
    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
3. Test Data (Indicated and Actual Values):
    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Filter static-pressure differential in inches wg.
    f. Preheat coil static-pressure differential in inches wg.
    g. Cooling coil static-pressure differential in inches wg.
    h. Heating coil static-pressure differential in inches wg.
    i. Outside airflow in cfm.
    j. Return airflow in cfm.
    k. Outside-air damper position.
    l. Return-air damper position.
    m. Vortex damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:
    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch o.c.
    f. Make and model number.
    g. Face area in sq. ft.
    h. Tube size in NPS.
    i. Tube and fin materials.
    j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
    a. Airflow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in inches wg.
    d. Outside-air, wet- and dry-bulb temperatures in degF.
    e. Return-air, wet- and dry-bulb temperatures in degF.
    f. Entering-air, wet- and dry-bulb temperatures in degF.
    g. Leaving-air, wet- and dry-bulb temperatures in degF.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.
    j. Entering-water temperature in degF.
    k. Leaving-water temperature in degF.
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig.
    n. Refrigerant suction temperature in degF.
    o. Inlet steam pressure in psig.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:
    a. System identification.
    b. Location.
    c. Coil identification.
    d. Capacity in Btuh.
    e. Number of stages.
    f. Connected volts, phase, and hertz.
    g. Rated amperage.
    h. Airflow rate in cfm.
    i. Face area in sq. ft.
    j. Minimum face velocity in fpm.
2. Test Data (Indicated and Actual Values):
    a. Heat output in Btuh.
    b. Airflow rate in cfm.
    c. Air velocity in fpm.

d. Entering-air temperature in degF.
e. Leaving-air temperature in degF.
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.
2. Motor Data:
a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.
3. Test Data (Indicated and Actual Values):
a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in degF.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.

j. Actual average velocity in fpm.
k. Barometric pressure in psig.

3.10 INSPECTIONS

A. Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:
    a. Measure airflow of at least 10 percent of air outlets.
    b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
    c. Note deviations to the Contract Documents in the Final Report.

END OF SECTION

SECTION 230700
HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
    a. Flexible elastomeric.
    b. Mineral fiber.
2. Adhesives.
3. Mastics.
4. Lagging adhesives.
5. Sealants.
6. Field-applied jackets.
7. Tapes.

B. Related Section: Division 22 Section “Plumbing Insulation.”

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

1.3 QUALITY ASSURANCE

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

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

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

1.4 DELIVERY, STORAGE, AND HANDLING

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

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

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

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

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

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

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; All-Service Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.
2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Products, Division of ITW; CP-35.
    b. Foster Products Corporation, H. B. Fuller Company; 30-90.
    c. ITW TACC, Division of Illinois Tool Works; CB-50.
    d. Marathon Industries, Inc.; 590.
    e. Mon-Eco Industries, Inc.; 55-40.
    f. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D1644, 59 percent by volume and 71 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 400 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Products, Division of ITW; CP-52.
    b. Foster Products Corporation, H. B. Fuller Company; 81-42.
    c. Marathon Industries, Inc.; 130.
    d. Mon-Eco Industries, Inc.; 11-30.
    e. Vimasco Corporation; 136.
3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
4. Service Temperature Range: Minus 50 to plus 180 degF.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 degF.

4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 TAPES

A. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    b. Compac Corp.; 120.
    c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
    d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140and 300 degF. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 degF with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

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

3.3 GENERAL INSTALLATION REQUIREMENTS

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

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

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive selfsealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

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

B. Insulation Installation on Pipe Flanges:

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

C. Insulation Installation on Pipe Fittings and Elbows:

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

D. Insulation Installation on Valves and Pipe Specialties:

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

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory-or-field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c.

Install vapor barrier consisting of factory - or - field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FINISHES

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

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

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

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

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

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.

3. Indoor, concealed return located in nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.0-lb/cu. ft. nominal density.

B. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.0-lb/cu. ft. nominal density.

C. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.0-lb/cu. ft. nominal density.

D. Concealed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.0-lb/cu. ft. nominal density.

E. Exposed, return-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.

F. Exposed, outdoor-air plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.

3.11 PIPING INSULATION SCHEDULE, GENERAL

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

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

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

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
    a. Flexible Elastomeric: 3/4 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
    a. Flexible Elastomeric: 1 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
    a. Flexible Elastomeric: 1 inch thick.
    b. Paint insulation with 2 coats of manufacturer’s UV resistive coating.

3.14 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

1.3 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. Solenoid valves.
2. Pressure-regulating valves.

1.4 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."

1.5 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.

1.6 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: Type K or Type L hard copper.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

2.2 VALVES AND SPECIALTIES

A. 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.
8. Maximum Operating Temperature: 275 degF.

B. 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.

C. 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 conduit adapter, and 24-V ac coil.

6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

D. 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.
7. Maximum Operating Temperature: 240 degF.

2.3 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:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-22: Monochlorodifluoromethane.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. 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 joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install packed-angle 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 solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

D. 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.

3.4 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. Where possible use (2) 45 degree fittings instead of 90 degree elbows with refrigerant piping runs.

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

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

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

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

J. Refer to Division 23 Sections for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. 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.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

U. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.5 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 B828 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.

3.6 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
2. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
3. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
4. NPS 4: Maximum span, 14 feet; minimum rod size, 1/2 inch.

E. Support multi-floor vertical runs at least at each floor.

3.7 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.

3.8 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. 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.
4. Charge system with a new filter-dryer core in charging line.

3.9 ADJUSTING

A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
B. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Verify that compressor oil level is correct.
2. Open compressor suction and discharge valves.

3. Open refrigerant valves except bypass valves that are used for other purposes.
4. Check open compressor-motor alignment and verify lubrication for motors and bearings.

END OF SECTION

SECTION 233113
METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

1.3 SUBMITTALS

A. Product Data: For each type of the following products: Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.

11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

1.4 QUALITY ASSURANCE

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

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct

Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.
    f. “Snap-Lok”

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A36, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 degF.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

A. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

1. For static-pressure classes 1- and 1/2-inch wg, comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Seal Class C, except as follows:
    a. Systems for residential occupancy.
    b. Ducts that are located directly in zones they serve.
    c. Ducts that have short runs from volume control boxes to diffusers.
    d. Return-air ceiling plenums.

3.3 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.

2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized steel primer. Paint materials and application requirements are specified in Division 09 Painting Sections.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests: Visually inspect duct system to ensure that no visible contaminants are present.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Turning vanes.
4. Duct-mounted access doors.
5. Flexible connectors.
6. Flexible ducts.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section for duct-mounted fire and smoke detectors.

1.2 SUBMITTALS

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

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.4 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. METALAIRE, Inc.
    f. Nailor Industries Inc.
    g. Pottorff; a division of PCI Industries, Inc.
    h. Ruskin Company.
    i. Trox USA Inc.
    j. Vent Products Company, Inc.
2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:
    a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
    b. Mitered and welded corners.

c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Stainless steel.
7. Bearings:
   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Air Balance Inc.; a division of Mestek, Inc.
   b. American Warming and Ventilating; a division of Mestek, Inc.
   c. Flexmaster U.S.A., Inc.
   d. McGill AirFlow LLC.
   e. METALAIRE, Inc.
   f. Nailor Industries Inc.
   g. Pottorff; a division of PCI Industries, Inc.
   h. Ruskin Company.
   i. Trox USA Inc.
   j. Vent Products Company, Inc.
2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Hat shaped.
   b. Galvanized-steel channels, 0.064 inch thick.
   c. Mitered and welded corners.
   d. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized, roll-formed steel, 0.064 inch thick.
6. Blade Axles: Stainless steel.

7. Bearings:
    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Blade Seals: Neoprene.
9. Jamb Seals: Cambered stainless steel.
10. Tie Bars and Brackets: Galvanized steel.
11. Accessories: Include locking device to hold single-blade dampers in a fixed position without vibration.

C. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.3 CONTROL DAMPERS

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

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Flexmaster U.S.A., Inc.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Ruskin Company.
9. Vent Products Company, Inc.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 8 inches.
2. Opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.

E. Blade Axles: 1/2-inch- diameter; stainless steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 degF.

F. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.4 TURNING VANES

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

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. SEMCO Incorporated.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Double wall.

2.5 DUCT-MOUNTED ACCESS DOORS

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

1. Ductmate Industries, Inc.
2. Flexmaster U.S.A., Inc.
3. McGill AirFlow LLC.
4. Nailor Industries Inc.
5. Pottorff; a division of PCI Industries, Inc.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Vision panel.
    d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
    d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.6 FLEXIBLE CONNECTORS

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

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 degF.

2.7 FLEXIBLE DUCTS

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

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 degF.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

C. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

C. Set dampers to fully open position before testing, adjusting, and balancing.

D. Install test holes at fan inlets and outlets and elsewhere as indicated.

E. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. At outdoor-air intakes and mixed-air plenums.
2. Control devices requiring inspection.

F. Install access doors with swing against duct static pressure.

G. Access Door Sizes:

1. Two-Hand Access: 12 by 6 inches.

H. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

I. Install flexible connectors to connect ducts to equipment.

J. Connect diffusers or light troffer boots to ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

K. Connect flexible ducts to metal ducts with draw bands.

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following: In-line centrifugal fans.

1.2 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on sea level.

B. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.

1.4 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

1. Acme Engineering & Mfg. Corp.
2. American Coolair Corp.
3. Ammerman; General Resource Corp.
4. Bayley Fans; a division of Lau Industries, Inc.
5. Breidert Air Products.
6. Carnes Company HVAC.
7. Greenheck.
8. Hartzell Fan, Inc.
9. Loren Cook, Inc.
10. Penn Ventilation.

B. Description: In-line, direct and belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories. Fiberglass for construction shall conform to ASTM Standard D4167.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting. Polyester resin with oxides to provide a Class I flame spread rating below 25 per ASTM E84. Fan C.

D. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Fan Wheels: Solid fiberglass, air foil design with aluminum insert molded to hub.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Companion Flanges: For inlet and outlet duct connections.
3. Motor and Drive Cover (Belt Guard): Epoxy-coated steel or fiberglass.

2.2 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

B. Enclosure Type: Open, drip-proof.

2.3 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 ADJUSTING

A. Adjust belt tension.

B. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Adjustable bar registers and grilles.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Krueger.
    b. METALAIRE, Inc.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
2. Material: Aluminum.

3. Finish: Baked enamel, white.
4. Face Size: 24 by 24 inches or 12 by 12 inches.
5. Face Style: Three cone.
6. Mounting: Surface and T-bar.
7. Pattern: Fixed.
8. Accessories: Plaster ring.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:

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. Krueger.
    b. METALAIRE, Inc.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
7. Frame: 1 inch wide.
8. Mounting: Countersunk screw.
9. Damper Type: Adjustable opposed blade.
10. Accessories: Rear-blade gang operator.

B. Bar Grille:

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. Krueger.
    b. METALAIRE, Inc.
    c. Nailor Industries Inc.
    d. Price Industries.
    e. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Frame: 1 inch wide.
7. Mounting: Countersunk screw.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

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

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 233723
HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of roof-mounting intake and relief ventilators: Roof hoods.

B. Related Sections include the following:

1. Division 08 Section "Louvers and Vents" for ventilator assemblies provided as part of the general construction.
2. Division 23 Section "HVAC Power Ventilators" for roof-mounting exhaust fans.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Intake and relief ventilators shall be capable of withstanding the effects of gravity loads, wind loads, and thermal movements without permanent deformation of components, noise or metal fatigue, or permanent damage to fasteners and anchors.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain ventilators through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of intake and relief ventilators and are based on the specific equipment indicated.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION

A. Coordinate installation of roof curbs and roof penetrations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

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

2.2 MATERIALS

A. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

B. Galvanized-Steel Sheet: ASTM A653, G90 zinc coating, mill phosphatized.

C. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners, unless otherwise indicated.

D. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

2.3 FABRICATION, GENERAL

A. Factory or shop fabricate intake and relief ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.4 ROOF HOODS

A. Available Manufacturers:

1. Acme Engineering & Mfg. Corp.
2. Aerovent; a Twin City Fan company.
3. Greenheck.
4. Loren Cook Company.
5. Penn Ventilation.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 5-6 and 5-7.

C. Materials: Aluminum sheet, minimum 0.063-inch- thick base and 0.050-inch-thick hood; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches.

E. Bird Screening: Galvanized-steel, 1/2-inch- square mesh, 0.041-inch wire.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install intake and relief ventilators level, plumb, and at indicated alignment with adjacent work.

B. Secure intake and relief ventilators to roof curbs with cadmium-plated hardware. Use concealed anchorages where possible.

C. Install intake and relief ventilators with clearances for service and maintenance.

D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Division 07 Section "Joint Sealants" for sealants applied during installation.

F. Label intake and relief ventilators according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION

SECTION 238126
SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

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

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/ IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 COORDINATION

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

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.
2. Fan Belts: One set of belts for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Carrier Air Conditioning; Div. of Carrier Corporation.
2. Trane Company (The); Unitary Products Group.

2.2 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Insulation: Faced, glass-fiber duct liner.
2. Drain Pans: Galvanized steel or molded polycarbonate, with connection for drain; insulated.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Disposable Filters: 1/2 inch thick, in fiberboard frames.

E. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type: Reciprocating.
2. Refrigerant: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Mounting Base: Polyethylene.

H. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2004, "Energy Standard for Buildings except Low-Rise Residential Buildings."

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install compressor-condenser components on rubber in shear neoprene isolators.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in Division 23 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 23 Section "Air Duct Accessories."

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

E. Electrical Connections: Comply with requirements in Division 26 Sections for power wiring, switches, and motor controls.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION

SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 CONSTRUCTION DRAWINGS

A. The contract drawings indicate the extent and the general conditions of the work. If any departures from the contract drawings are deemed necessary by the sub-contractor, details for such departures and the reasons therefore shall be submitted to the Engineer immediately.

B. These items shall be submitted, in writing, for approval. No such departure shall be made without prior written approval of the Architect and Engineer.

C. The drawings are diagrammatic and indicate the general arrangement of fixtures, equipment and work included in the contract. Consult the architectural drawings and details for exact location of fixtures and equipment.

D. The sub-contractor shall follow the drawings in laying out work and check the drawings of other trades to verify spaces in which work will be installed. Maintain head room and space conditions at all points. Where head room or space conditions appear inadequate, notify the Architect before proceeding with the installation.

E. Likewise, the sub-contractor shall follow the drawings in laying out work and coordinate with the drawings of other trades to verify locations for all equipment on site. Maintain proper clearances from new or existing utilities or structures. The sub-contractor is responsible for coordinating any requirements of local utilities. Where space or clearance conditions appear inadequate, notify the Architect before proceeding with the installation.

F. If directed by the Architect, the sub-contractor shall, without extra charge, make reasonable modifications (as judged by Architect) in the layout and installation of the electrical equipment, fixtures, and devices as needed to prevent conflict with work of other trades (whether on site or within structure); to prevent conflict with new or existing utilities (whether on site or within structure); or for proper execution of the work.

1.2 ORDINANCES AND REGULATIONS

A. If the work as laid out, indicated, or specified is contrary to, or conflicts with codes ordinances or regulations, the sub-contractor shall report same to Architect before submitting his bid. Architect will issue instructions as to procedure.

1.3 PERMITS AND FEES

A. The General Contractor shall insure that the necessary permits and inspections required

for his work are obtained. He shall deliver to Architect certificates of inspection issued by authorities having jurisdiction.

1.4 GUARANTEE AND SERVICE

A. In addition to guarantee of equipment by manufacturer of each piece of equipment specified herein, each sub-contractor shall also guarantee such equipment and make good any defect of material or workmanship occurring during a period of (1) year from final acceptance test, without expense to Owner.

B. Each Subcontractor shall service systems for (1) year from final acceptance. Such service will include lubrication, necessary adjustment, and/or replacement of defective equipment and materials furnished. Incandescent light bulb (incandescent only) replacement guarantee shall be limited to 30 days, H.I.D. and fluorescent lamps at 180 days after final acceptance.

1.4 CODES AND INSPECTIONS

A. Work shall comply with:

1. National Electric Code (2008 edition)

2. O.S.H.A. Standards

3. State of Florida ADA Handicap Requirements

4. 2007 State of Florida Building Code including the 2009 amendments.

5. Other Standards so adopted by the Florida Building Code.

1.5 SCOPE

A. Furnish labor, materials, and equipment necessary for a complete and workable system and installation.

1.6 STORAGE OF MATERIALS

A. Prior to and during installation, store materials to protect them from injury or deterioration. Material shall not be stored in contact with ground or floor. If suitable storage areas are not available at job site, provide temporary construction or store material off-site in suitable warehouses. Do not remove manufacturer's packing materials until ready to install.

1.7 ELECTRICAL SERVICE

A. Electrical service and feeders shall be as indicated. Consultation and coordination with applicable Utility Company representative is a sub-contractor job requirement prior to start of project. Coordination shall occur within 7-days of sub-contract award. Advise Architect and Engineer immediately of any changes which will cause an increase of cost to the Owner or other change of scope; without notification within 7 days, no cost increases will be accepted.

1.8 CONTINUITY OF SERVICE

A. Uninterrupted use of existing facility must be continued during the entire time required for the installation of equipment and work required under this contract. This shall be applicable to all electrical systems involved in this contract and shall include: power, lighting, fire alarm, telecommunications, television, etc..

B. Contractor shall perform all work so as to maintain the lowest possible amount of “down time.” Connections to existing services or equipment, change of service, or any other work that will require periods of “down time,” shall be scheduled and performed after hours so as to prevent “down time.”

C. If after-hour work is not acceptable to client/owner, contractor may opt to schedule “down time” with the owner. This “down time” shall be schedule a minimum of 48 hours in advance of the proposed interruption.

1.9 REMOVAL OF EXISTING CIRCUITRY

A. Where existing devices are to be removed during construction (or demolition), all fixtures, conduits, boxes, and wiring (not required to maintain continuity of service) shall be completely removed.

B. Any removed equipment of value shall be given to the owner for storage. Contractor shall otherwise be responsible for disposal of demolished equipment and materials.

1.11 EXISTING BUILDING EQUIPMENT

A. Contractor shall disconnect and remove all existing equipment within an area of renovation, unless specifically required to remain or to maintain continuity of service. If the plans require the installation of a new receptacle, light fixture, or other device in a location where an existing device is installed, the contract may re-use the existing conduit and boxes.

1.12 COORDINATION

A. It shall be the responsibility of the electrical contractor to coordinate the installation

details of all electrically operated equipment and devices. This shall include all light fixtures and other devices within structures, on exterior of structures, or on site.

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.

4. So connecting raceways and wireways will be clear of obstructions and of the working and access space of other equipment.

B. Contractor is encouraged to mach up equipment (along with other trades) in areas expected to be “tight” prior to actual installation to judge fit and make adjustments accordingly.

C. The electrical contractor shall periodically inspect the installations of other trades (HVAC, plumbing, fire protection, etc.) and notify the General Contractor, Architect, and Engineer of any conflicts with electrical systems.

C. Any courses of action taken to accommodate conflicts after-the-fact shall not be considered as “extra services” and will not be subject to additional billings as such.

D. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

E. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

F. Coordinate sleeve selection and application with selection and application of fire stopping specified in Division 7, “Penetration Firestopping.”

1.13 SUBMITTALS

A. All submittals of electrical materials or equipment shall be made at the same time contained within one binder and one letter of transmittal. Follow the procedures specified in Division 1.

B. See Architectural front end additional requirements for shop drawing procedures.

C. Provide shop drawings in hard copy (book) format for the following:

1. Light fixtures and lamps

2. Switchgear and panelboards / loadcenters

3. Electrical devices (switches, receptacles, cover plates)

4. Any and all Electronics including TVSS (Surge Protection devices)

5. Wire & cable

6. Conduit & fittings

7. All associated systems equipment

8. All devices

D. Corrections or comments made on shop drawings during review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with design concept of project, and general compliance with information given in contract documents.

PART 2 – PRODUCTS

2.1 GENERAL

A. Materials and equipment are specified herein by a single or by multiple manufacturers, to indicate quality, material, and type of construction desired. One Manufacturer's product is indicated and has been used as basis for design; it shall be each Subcontractor's responsibility to ascertain that alternate Manufacturer's products conform to detailed specification, and that size and arrangement of equipment is suitable for installation. Products of other Manufacturer's will be considered for use if in the Engineer's opinion, item requested for substitution is equal to that specified. Should a Subcontractor desire to make a substitution, he should apply in writing, stating amount of credit or extra involved, including complete Engineering data.

B. It shall be the responsibility of each sub-contractor making a substitution to include costs for changes required by other trades for proper operation of equipment proposed to be substituted.

C. Before purchase of equipment, submit shop drawings for approval. Submit as complete as possible. Identify each item submitted. Information on shop drawings shall contain all that is necessary to show that equipment complies with specifications and drawings. Show required modifications. One complete set of approved shop drawings shall be kept at job site.

D. The subcontractor is responsible for providing all incidental materials needed for a complete and working installation. This is in addition to the specific equipment specified in the contract documents.

E. All materials and equipment furnished under this contract shall bear the label of approval of the Underwriters Laboratory, Inc. (UL).

2.2 INSTRUCTIONS

A. Each sub-contractor shall furnish (3) complete sets of operations and maintenance instructions applying to each piece of equipment installed in conjunction with this contract.

PART 3 - EXECUTION

3.1 SUPERVISION

A. Maintain competent Superintendent in charge of work. Superintendent shall be qualified and have suitable experience in type of work involved.

B. Should he be deemed not capable by Architect, he shall be replaced immediately by a Superintendent who is satisfactory. After a satisfactory Superintendent has been assigned, he shall not be withdrawn without consent of Architect.

3.2 WORKMANSHIP

A. Materials and equipment shall be installed in a neat and industry standard manner as judged by the Engineer of Record.

B. Architect reserves right to direct removal and replacement of items which, in his opinion, do not present an orderly and reasonably neat appearance provided such as orderly installation can be made using customary trade methods. The removal and replacement shall be done when directed in writing by Architect at sub-contractor's expense and without additional expense to Owner.

3.3 CONNECTING TO WORK OF OTHERS

A. Before starting his work and from time to time as work progresses, the Electrical sub-contractor's superintendent shall examine work and materials installed by others insofar as they apply to his own work, and shall notify the Architect immediately in writing of conditions which will prevent satisfactory results from the installation of the system.

B. Should the Electrical subcontractor start his work without proper notification, it shall be construed as an acceptance by him of all conditions and as to suitability of the work of

others to receive his work.

3.4 DAMAGE TO OTHER WORK AND PERSONNEL

A. Each sub-contractor shall be responsible for proper protective measures when working overhead or in finished areas. He shall repair, replace, or touch up finished surface which may be damaged as a result of his work or operations. This is to include preparation, priming, and refinish of structure due to welding or machining for attachment of electrical equipment.

B. Subcontractor shall carry suitable insurance as prescribed by law for protection of his employees, other persons, materials and equipment on site.

3.5 CUTTING, PATCHING, AND EXCAVATIONS

A. Cutting and patching of walls, partitions, floors, concrete, pits and chases in wood and masonry will be done by this sub-contractor as indicated or as directed by Architect. Cutting of steel, wood, or other main structural parts must be approved by Architect prior to commencing cutting.

B. Sub-contractor shall do necessary excavation and back-filling for his own work.

3.6 REMOVAL OF RUBBISH

A. Subcontractor shall maintain premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work he shall remove tools, scaffolding, materials and rubbish from building site, and leave premises and his work in a clean, orderly, and acceptable condition.

3.7 CLEANING AND ADJUSTMENTS

A. Upon completion of work, each sub-contractor shall clean, oil, and grease fans, motors, and other running equipment and apparatus which he installs, and shall make certain such apparatus and mechanisms are in proper working order and ready for test.

3.8 ACCEPTANCE INSPECTION

A. Contractor shall read applicable sections of these specifications, and prepare and assemble required test reports, maintenance manuals, certificates, guarantees and letters of instruction. Contractor's representatives responsible for work under Division 16 shall be present at time of acceptance inspections, and shall furnish required mechanics, tools, and ladders to assist in inspection.

B. Prior to requesting final inspection, the sub-contractor shall clean, and where required, paint electrical equipment installed. Exposed conduits, exposed outlet boxes, surface

panel cabinets, etc. shall be finished to match walls or ceilings. Cabinets, panels, panel covers, scratched or otherwise damaged shall be painted with factory supplied color-matched paint. Interiors of panelboards, switchboards and cabinets shall be vacuumed, free of dust and debris.

C. List of items to be corrected as a result of acceptance inspection will be furnished to the Architect for transmittal to the General Contractor.

D. Notify Architect in writing of items appearing on list for correction which are disputed by the sub-contractor. When ready, request in writing a re-inspection of work. Should items on the rejection list remain uncorrected, additional inspections required to ascertain completion shall be paid by Contractor to the Engineer at current billing rates of the Engineer.

3.9 EQUIPMENT CONNECTIONS

A. Provide electrical power and control systems to indicated equipment. Included are wiring, raceways, disconnects, and other devices. Motor starters for mechanical equipment, if not an integral part of the equipment, are the direct responsibility of the electrical sub-contractor to provide, install, and connect as directed by the mechanical sub-contractor. Starter heater sizes, etc. shall be coordinated with the actual equipment installed. Circuit breaker combination type NEMA 1 starters with 120 volt control shall normally be the requirement. Control wiring shown on mechanical drawings shall be provided under this section by the mechanical Contractor if it is a low voltage controls system, however all cabling shall meet the requirements of this division. The electrical Contractor shall coordinate all details of the control wiring for any conduit requirements. Maintain (1) set of approved equipment shop drawings and control system wiring diagrams on the job. Provide rough-in power and control in accordance with this set.

B. Rough-in locations, type of connection (straight blade or twist-lock receptacle, wall junction box with flex conduit to unit, or unit mounted J-box etc.), ampacity of the connections, single or 3-phase circuits required are end responsibility of Electrical Contractor. This applies to such equipment as: water coolers, water heaters, pumps, A/C condensing units, A/C air handlers, vent and exhaust fans, heat strips and unit heaters, and other equipment. Final information must be obtained from the actual "to be installed" equipment drawings; do not order branch circuit breakers until the equipment shop drawings have been reviewed.

END OF SECTION 260500

SECTION 26051
TEMPORARY POWER & LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. This sections contains specifications and requirements for the installation of equipment and devices to be used for temporary construction power.

1.2 SCOPE

A. The Electrical Contractor shall be responsible for the permitting, provision, and installation of temporary construction power equipment and the maintenance of temporary power.

B. Arrangements shall be made with the Utility Company for source location for power to be used by all trades during the period of construction.

C. The location of the service and distribution point for temporary power shall be designated by the General Contractor.

D. Power costs during construction and testing shall be paid by the General Contractor.

1.3 SERVICE CAPACITY

A. Minimum size of electrical temporary service shall be 200 amps at 120/240 volt, single phase.

1.4 DISTRIBUTION

A. A single point of distribution shall be provided with each trade power user responsible for site distribution for their own needs with the exception of lighting. Current O.S.H.A., A.D.A., and N.E.C. code rules shall govern installation and equipment.

1.5 TEMPORARY LIGHTING

A. Lighting will be required in all spaces at a minimum level of 30 foot candles measured at floor level. At a minimum, there shall be one lamp per space at all times. Electrical Contractor shall be responsible for maintenance of temporary lighting.

PART 2 – PRODUCTS

2.1 GENERAL

A. All equipment supplied for use as temporary power and lighting shall be UL listed.

B. All 15 and 20 Amp, 120 Volt receptacles for use as temporary power shall be protected from ground fault.

PART 3 – EXECUTION

Section not used.

END OF SECTION 26051

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes specifications for the following:

1. Building wires and conductors rated 600 Volts and less.

2. Connectors, splices, and terminations rated 600 Volts and less.

1.2 QUALITY ASSURANCE

A. All cables and conductors shall be listed for the environments in which they are to be installed.

1.3 SUBMITTALS

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

B. Qualification Data: For testing agency.

C. Field quality control test reports.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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

C. Comply with NFPA 70.

PART 2 – PRODUCTS

2.1 GENERAL

A. Conductors shall be copper (unless noted otherwise on plans). Conductor insulation type shall THHN/THWN or XHHW. All conductor ampacities are to be based upon 75 degree C (Centigrade) insulation. No down-sizing is permitted of conductor size based upon use of 90 degree C rated insulation.

B. Conductors sizes number 10 and smaller are to be solid Copper. Larger sizes are permitted to be stranded.

2.2 MANUFACTURERS

A. Connectors and Splices: Subject to compliance with requirements, provide products by:

1. Ideal Industries

2. 3M, Electrical Products Division

3. Hubbell

4. Pass and Seymour

B. Conductors: Subject to compliance with requirements, provide products by:

1. American Insulated Wire Corp.

2. General Cable Corporation

3. Southwire Company

PART 3 – EXECUTION

3.1 INSTALLATION

A. Branch circuit outlets shall be connected as indicated.

B. The continuity of neutrals of branch circuits shall not be made on the terminals of any device. Instead, the neutral shall be spliced and tap connected to device. This will assure no opening of neutral in replacement of device.

C. Fixture and branch circuit wiring joints for conductors No. 6 AWG and smaller in junction and outlet boxes shall be made with U.L. approved pressure type connectors. Use Ideal Industries Models 451, 452, or 454 and Scotch-Lock types Y, R, or B. Splices and taps for conductors No. 4 AWG and larger shall be made using 2 bolt type solder-less connectors made of high conductivity bronze castings, taped with at least 3 layers of insulating tape, half-lapped. No spring or wedge type “push-in” connections are permitted.

D. All fixture terminations shall be made by means of clamp type connectors using screws or bolts to apply pressure. No spring or wedge type “push-in” connections are permitted. 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.

E. See section “IDENTIFICATION FOR ELECTRICAL SYSTEMS” for coloring and marking of cabling.

F. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. 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.

3.2 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

END OF SECTION 260519

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section contains specifications for grounding and bonding equipment.

1.2 GENERAL

A. Provide grounding and bonding systems in strict accordance with applicable edition of N.E.C. Art. 250.

1.3 SUBMITTALS

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

1.4 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 UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2.1 GENERAL

A. All bonding and grounding shall be with copper conductors where wire type conductors are utilized.

B. Outlet box to device shall be by use of self-grounding devices or a separate "pigtail" to the raceway/box grounded system.

C. Ground rod electrodes to be a minimum of ten feet in length, Copper-clad steel, 3/4" in diameter, sectional type.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Service entrance ground shall consist of a set of electrodes as described and specified in NFPA 70. Art. 250.50 (a) (b) & (c). The primary grounding electrode is to be 20 feet of

number 4 (1/2") reinforcing steel in the building footer or foundation with the end turned up above slab for approved clamp connection. "Made" electrodes described in NFPA 70 250.52 shall be used in addition to the above where conditions permit. If it is not possible to connect to steel within the building footer or foundation, the contractor shall provide at least one concrete encased “Made” electrode. Interconnect conduits entering and leaving service entrance equipment using grounding bushing and copper wire of the ampacity required by Art. #250. Provide connection to service entrance ground. All electrodes shall be bonded together as required by Art. #250.

B. All equipment which receives power from the electrical service shall be connected to the premises grounding system with a conductor sized from NFPA 70, Table 250.122.

C. All metal interior piping and ductwork shall be bonded to the electrical service equipment enclosure with a conductor sized by 250.66.

D. The size of the service grounding electrode conductor shall be in accord with 250.66.

E. All telecommunications and signaling equipment to be bonded to the electrical service equipment with a #6 Copper conductor.

1. Terminate bond conductor at 1/4" x 2” x 12” grounding bus at each service and central equipment location.

2. Terminate bond conductor on appropriate cabinet terminal at each terminal cabinet.

3.2 INSPECTION AND TESTING

A. Upon completion of electrical installation, contractor shall visually inspect all grounding and bonding connections for security.

B. Subsequent to visual inspection, the contractor shall test the resistance to ground of the grounding electrodes.

1. Testing shall be performed when soil is dry and 48 or more hours have passed since any precipitation has occurred.

2. Testing shall use fall-of-potential test method according to IEEE 81.

3. Resistance shall not exceed 20 Ohms to ground between earth and electrodes. If resistance is greater than 20 Ohms, contractor shall install additional grounding electrodes until resistance is 20 Ohms or less.

4. Prepare report of all test results and any corrective measures that were applied. Report shall include dimensional drawings of all test locations, ground rods, electrodes, etc..

C. If resistance to ground is found to be excessive, notify Architect promptly and include recommendations for reduction.

END OF SECTION 260526

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes specifications and requirements for:

1. Hangers and supports for electrical equipment and systems.

2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 SUBMITTALS

A. Product Data: For all support systems.

1.4 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.5 COORDINATION

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

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 – PRODUCTS

2.1 GENERAL

A. Supporting devices shall be of materials having corrosion protection at least equal to the raceway.

B. For environments exposed to salt such as coastal environments, supports and fasteners shall be stainless steel.

2.2 MANUFACTURERS

A. Steel Slotted Support Systems: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
   1. Allied Tube & Conduit

   2. Cooper B-Line, Inc.

   3. Thomas & Betts Corporation

   4. Unistrut; Tyco International, Ltd.

B. Raceway Supports: As described in NECA 1 and NECA 101.

C. Conduit Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway to be supported.

D. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

   1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

      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) Cooper B-Line, Inc.; a division of Cooper Industries.

         2) Hilti Inc.

         3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.

5. Toggle Bolts: All-steel springhead type.

6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Support raceways securely with conduit straps, wall brackets, conduit hangers or ceiling trapeze. Fastenings shall be by sheet metal screws or screw type nails to wood, by toggle bolts to concrete block, expansion bolts on concrete or brick and beam clamp on steel or bar joists. Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Raceways shall not be fastened to suspended grid ceiling supports but must have independent support from the structure.

D. Support shall be provided as close as practical to, but not exceeding 18 inches from an unsupported box or from change of direction. In horizontal runs this support may be omitted if box is independently supported and box connection is not made with chase nipple or threadless box connector. In vertical runs, load produced by weight of raceway and conductors shall not be carried by raceway terminal but must be carried entirely by conduit supports.

E. All supports shall be located according to N.E.C. Article 300.

3.2 INSTALLATION OF FABRICATED METAL SUPPORTS

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

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.4 PAINTING

A. Touchup: Comply with requirements in Division 09 Painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 260529

SECTION 260533
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes specifications and requirements for electrical raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 GENERAL

A. Raceway locations shown are diagrammatic. Runs are to be governed by structural conditions. Install raceways concealed unless specifically noted. Cap conduits immediately after installation to prevent entrance of foreign matter. Run concealed raceways with minimum bends in shortest practical distance. Bends and off- sets shall be of code radius. 360 degrees total accumulation of bends in a single run is the maximum allowed. Run exposed conduit parallel and perpendicular to surface or exposed structural members. Follow surface contours as much as practical to provide a neat appearance.

B. These specifications apply to all conduits for all systems on the project, including telephone, CATV, security, fire alarm, etc..

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.

2. For handholes and boxes for underground wiring, including the following:

a. Duct entry provisions, including locations and duct sizes.

b. Frame and cover design.

c. Grounding details.

d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

e. Joint details.

C. Source quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories are to be 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Conduits shall be by one of the following:

1. Pittsburgh Standard
2. Youngstown
3. Republic
4. Wheatland
5. Allied Tube
6. Carlon

B. Boxes shall be by one of the following:

1. Thomas & Betts (T&B)
2. RACO
3. Carlon
4. O-Z

C. Fittings shall be by one of the following:

1. T&B
2. Hubbell

3. Allied Tube

4. Caddy

5. RACO

6. Carlon

7. O-Z

D. Other manufacturers may be used subject to prior approval.

2.2 CONDUIT

A. EMT

1. Electrical metallic tubing (EMT) shall be galvanized steel. Aluminum is not permitted.

Use of EMT larger than 4" is not permitted. Do not install EMT in concrete and other areas where rigid conduit is specified.

2. All EMT box connectors shall be insulated throat type.

3. All fittings shall be compression type.
4. ANSI C80.3.

B. FMC

1. Flexible Metal Conuit (FMC) shall be of Zinc coated steel construction. Aluminum is not permitted.

2. All FMC box connectors shall be insulated throat type.

3. 3/8" aluminum Greenfield for fixture "pigtails" and 1/2" aluminum Greenfield for small motor (1 horse power or less) connections are acceptable.

C. LFMC

1. Liquidtight Flexible Metal Conduit (LFMC) shall be of steel construction. Aluminum is not permitted.

2. All LFMC box connectors shall be insulated throat type.

D. LFNC

1. Liquidtight Flexible Nonmetallic Conduit (LFNC) shall be Type B of PVC construction.

2. Conduit shall have smooth interior walls.

3. All LFNC box connectors shall be insulated throat type.

E. RMC

1. Rigid Metallic Conduit (RMC) shall be of hot-dipped galvanized construction. Aluminum is not permitted.

2. All RMC box connectors to be threaded with insulated throats.

3. All threaded fittings are to have joint compound applied prior to installation. Compound to be listed for use in electrical installations to lubricate and protect joint from corrosion and enhance electrical conductivity.

F. RNC

1. Rigid Nonmetallic Conduit (RNC) shall be Schedule 40 or 80 PVC, NEMA TC 2.

2. Fittings are to be NEMA TC 3 and shall match conduit type and material.

2.3 JUNCTION BOXES

A. Provide junction boxes in quantities, locations, and sizes as required by installation or code.

B. All interior boxes shall be of galvanized steel construction. Provide cover plates of same construction as box.

2.4 ELECTRICAL BOXES AND FITTINGS

A. Outlet boxes shall be one-piece or projection welded galvanized stamped steel for ganged sizes required. Sectional boxes are not be acceptable. Where necessary, boxes larger than standard shall be provided in accordance with the National Electrical Code to prevent crowding of conductors. Outlet boxes required for communications systems and mechanical control devices shall be installed under this section. Verify outlet box size required for systems other than electrical power from shop and manufacturer's drawings. Install outlets in accordance with those requirements.

B. Fire rated walls and ceilings may require special consideration and hardware in order to conform to U.L. penetration details and requirements such as the size of allowable openings (square inches) allowed in gross area or between vertical studs in walls. Fire rated enclosures may also be required.

C. All fittings for Hazardous (Classified) locations shall be rated for such environments and shall comply with UL 886.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Comply with SCTE 77.

1. Color of Frame and Cover: Gray.

2. Units shall be designed for flush burial and have integral closed bottom, unless otherwise indicated.

3. Cover to be weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

4. Cover finish to be nonskid finish shall have a minimum coefficient of friction of 0.50.

5. Cover legend to be molded lettering, as indicated for each service.

6. Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover to be molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

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

a. Armorcast Products Company.

b. Carson Industries LLC.

c. CDR Systems Corporation.

2.5 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.

2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 – EXECUTION

3.1 MATERIALS APPLICATION

A. Outdoors

1. Exposed above ground: RNC, Schedule 40

2. Exposed above ground, subject to damage: RNC, Schedule 80

3. Underground: RNC, Schedule 40

4. Boxes and enclosures: NEMA 4.

5. Underground mounted hand holes and boxes, not subject to vehicular traffic and loading: Polymer concrete, SCTE 77, Tier 15 structural load rating.

6. Hazardous classified locations, under or above ground: RMC

B. Indoors

1. Exposed above floor: EMT

2. Exposed above floor, subject to damage: RMC

3. Under or within floor slab-on-grade: RNC, schedule 40

4. Within elevated slab: RNC, schedule 40

5. Concealed within floor trusses, ceiling spaces, wall cavities, etc.: EMT

6. Damp or wet listed locations: RNC

7. Hazardous classified locations, under or above slab: RMC

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water piping. Do not install horizontal raceways above or below steam piping.

B. Unless noted otherwise, conduit run indoors is to be concealed within finished ceilings, wall, and floors.

C. Exposed conduits in damp or wet locations and where exposed to weather shall be installed with off-set brackets or supports to maintain a clearance of at least 1" to finished surface.

D. For slab-on grade construction, rigid conduit shall be installed below floor slab under curing or damp proofing membranes. Sub-contractor performing work under this section of specifications shall be responsible for maintaining integrity of damp-proofing membranes penetrated by raceways or boxes

E. Penetrations through roofs shall be made using approved pitch pockets with construction details conforming to roofing construction.

F. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

G. Conduits in slabs other than slab-on grade shall be installed as close to middle of slabs as practical without disturbing reinforcement. Parallel runs of conduit shall not be spaced closer than 3 diameters on centers except at cabinet and outlet box locations. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Raceways crossing expansion joints in concrete slabs shall be installed with expansion fittings.

H. Where rigid conduit is installed into a cabinet, box or gutter, use insulating throat bushing T&B series 222, 0-Z type A or RACO series 1402. Use two T&B series 141 lock-nuts to secure conduit to enclosure. Grounding bushing shall be 0-Z type BL. Expansion/deflection fittings shall be 0-Z type DX.

I. Connect motors and equipment subject to vibration with flexible conduits. In interior dry locations, FMC shall be used. In interior locations subject to minor amounts of moisture, LFMC shall be used. In exterior and interior wet locations, LFNC-B shall be used. All flexible conduits shall have separate bond wire except fixture tails. Any flexible connections located in listed/classified locations shall be in accordance with the wiring methods for that location.

J. Penetrations of all fire rated walls and ceiling-floor assemblies must be in strict accord with the approved and listed either U.L. assemblies, 3-M Company, or U.S. Gypsum details, alternate penetration methods will be approved if acceptable to the Code Authority having Jurisdiction.

K. It is to be noted that all raceways within the Elevator machine room shall be in metal conduit, no PVC allowed.

L. Boxes for wall and ceiling outlets shall finish flush and straight at edge of finished surface. Wall outlets in exposed concrete block, masonry and tile walls shall be installed with extra-deep square corner boxes or with standard boxes and square cornered tile wall covers, so that conduit off-sets are not required. Outlet boxes for light fixture mounting shall be equipped with fixture studs. No outlets shall be installed back-to-back in any wall.

M. Outlet boxes for switches shall be 4" from door jamb. Outlets occurring above counters, cabinets, or mirrors shall be correlated by Contractor so that outlet clears trim or is located in back splash as noted on drawings. See architectural interior elevations for locations.

N. All conduit and box installation is to be completed prior to any conductor installation.

O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

P. All wiring shall be in conduit. Contractor may extend MC cable “whips” in grid type ceilings from junction boxes to individual light fixtures (maximum length of 10’). Hard ceilings (or those otherwise inaccessible) shall be full conduit.

3.3 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support handholes and boxes on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.2 INSPECTION

A. Contractor shall verify all conduit fittings such that there is no play in the connection.

B. Repair any damage to any paint, enamel, or galvanizing coatings with manufacturer recommended touchup coating.

END OF SECTION 260533

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes identification requirements for raceways, power and control cabling, conductors, equipment, and other electrical systems.

1.2 GENERAL

A. Coordinate all identification and labeling with other trades for proper equipment names.

B. Coordinate all identification and labeling with requirements of other Sections requiring identification, Drawings, Shop Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual with requirements of local Codes and applicable Standards.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70, ANSI 13.1, and ANSI C2.

PART 2 – PRODUCTS

2.1 RACEWAYS

A. Labeling shall be black letters on orange background and indicate voltage and system type.

B. Self-adhesive labeling shall be preprinted by machine. Material shall be permanently flexible and laminated with a clear, all-weather, chemical & UV resistant film. Edges shall be taped with matching tape to protect label edges.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

2.2 POWER & CONTROL CABLING

A. Self-adhesive labeling shall be preprinted by machine. Material shall be permanently flexible and laminated with a clear, all-weather, chemical & UV resistant film. Edges shall be taped with matching tape to protect label edges.

2.3 CONDUCTORS

A. Color coding tape shall be 3 mil, self adhesive, 1 to 2 inch wide.

B. Self-adhesive labeling shall be preprinted by machine. Material shall be permanently flexible and laminated with a clear, all-weather, chemical & UV resistant film. Edges shall be taped with matching tape to protect label edges.

C. Marking tape shall be self adhesive vinyl wrap-around type with machine printed text.

2.4 EQUIPMENT

A. Engraved, laminated acrylic or melamine label prepunched or drilled for riveting to equipment. White letters on a dark-gray background with minimum letter height shall be 3/8 inch.

B. Panel schedules shall be machine printed with each circuit clearly identified.

2.5 SIGNAGE

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes. Signs shall be engraved with black letters on white face, prepunched or drilled for mechanical fasteners.

2.6 WARNING LABELS AND SIGNAGE

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-adhesive warning labels are to be factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Signage is to have a nominal size of 7 by 10 inches.

D. Warning labels and signage shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.7 WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.

2. Printing on tape shall be permanent and shall not be damaged by burial operations.

3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to destructive substances commonly found in soils.

4. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum foil core, and a clear protective film to allow inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct burial service.

5. Overall Thickness: 8 mils.

6. Foil Core Thickness: 0.35 mil.

7. Weight: 34 lb/1000 sq. ft.

8. 3-Inch Tensile According to ASTM D 882: 300 lbf, and 12,500 psi.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Power marking tape to be red colored and shall marked with “ELECTRIC LINE, HIGH VOLTAGE”.

3. Communications marking tape to be orange colored and marked with one of the following (depending on system installed): “TELEPHONE CABLE”, “CATV CABLE”, “COMMUNICATIONS CABLE”, “OPTICAL FIBER CABLE”.

PART 3 – EXECUTION

3.1 GENERAL

A. Conduits & Raceways shall be marked and labeled as follows:

1. Accessible conduits, raceways, and boxes shall be factory colored. Colors shall be:

a.	120/240 (or 208) Volt Normal Power	Yellow
b.	120/240 (or 208) Volt Emergency Power	Fluorescent Red
c.	277/480 Volt Normal Power	Fluorescent Yellow
d.	277/480 Volt Emergency Power	Fluorescent Orange
e.	Isolated Ground	Orange “dot” on cover plate
f.	Fire Alarm	Red
g.	Telephone	Blue
h.	Security	Purple
i.	CATV	Black
j.	Ground	Green
k.	PA or Sound	Brown
l.	Controls	White

Optionally, contractor may spot mark systems with paint at 25’ intervals on straight runs and 5’ intervals in congested areas. Paint swatches shall be 6 inches and encircle conduits and raceways and shall cover entire cover plate of boxes.

Contractor shall coordinate exposed conduits in “architecturally finished” spaces. If requested by architect, contractor shall paint conduit to match architectural finish. Contractor shall not spot mark conduit with colors above in this instance. However, if conduit painting to match architectural finish extends into an open ceiling, conduit shall be marked above “ceiling” line.

2. Gang type junction boxes for installation of devices (receptacles, switches, etc) shall not have their faceplates marked as above. Instead, contractor shall mark interior of box.

3. Contractor shall label all boxes containing power cabling with the panel and circuit of origin of each conductor within the box. Marking shall be made with permanent black marker and stencil with 1/4” lettering.

4. Faceplates of telephone, security, CATV, PA, and sound devices shall small adhesive type labeling applied at each device indicating device number. Unique numbers shall be given to each device for ease of identification.

B. Cabling shall be marked and labeled as follows:

1. All power cabling shall be identified where it is accessible and in boxes, troughs, panels, etc. as follows:

    a. An identification label shall list panel and circuit of origin and shall be affixed to each individual cable.

2. Low voltage cabling (telephone, security, CATV, etc.) shall have outer jacket coloring to match colors delineated for conduits and boxes of same system above.

3. Telephone, security, CATV, PA, and sound cabling shall have adhesive type wrap labels applied indicating terminating device number. Labels shall be affixed at every location where cable can be accessed.

C. Conductors shall be marked and labeled as follows:

1. Power conductors shall have adhesive type wrap labels applied indicating panel and circuit of origin. Labels shall be affixed at every location where cable can be accessed.

2. Power conductors shall be identified by color as follows:

    a. Color coding of cabling on 120/208 Volt, Three Phase systems shall be:

        1. Phase “A” Black
        2. Phase “B” Red
        3. Phase “C” Blue
        4. Neutral White
        5. Ground/Bond Green
        6. Switch Purple

    Wiring of size #10 and smaller shall have factory colored insulation as listed above. Larger sizes may be marked by tape.

D. Equipment shall be marked as follows:

1. All equipment listed as NEMA 1, or located inside of building or structure (so long as location is not classified), shall have identification label riveted to enclosure.

2. All equipment listed other than NEMA 1, shall have stencil type label painted onto enclosure. Lettering shall be 1 inch tall (minimum) and of contrasting color to equipment enclosure.

3. In storage rooms, equipment rooms, and other rooms that may be used for storage by the Owner, contractor shall paint on floor boundaries of dedicated equipment space. Paint shall be a high-traffic, non-slip, epoxy type, yellow in color. Boundary stripes shall be 2 inches in width. The words "DEDICATED EQUIPMENT SPACE – NO STORAGE PERMITTED" shall be painted into boundary with same paint. Lettering shall be 2 inches in height and shall be stenciled. Contractor shall not apply this to finished rooms such as offices, break rooms, or other normally occupied spaces finish with architectural type finishes.

4. Panels shall have machine printed panel schedules affixed to inside of door. Schedules shall indicate all circuits (including "SPARES" and "SPACES"), panel designation, origin and size of service feed, voltage, phase, and buss size.

5. Panels shall have the conduit and conductor color coding legend indicated above posted on them.

3.2 INSTALLATION

A. Coordinate and verify each item prior to installation of identification labeling.

B. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Coordinate the installation of labeling to occur after the application of surface textures and/or painting of surfaces or equipment which may impair legibility of verbiage. Labeling shall also occur prior to the installation of any ceilings or barriers to make equipment generally inaccessible.

D. Color tape shall be wrapped around individual conductors for 6 inches with 1/2 laps. Start and terminate wrap with three passes with no tension to prevent unraveling.

E. Clean surfaces to have self-adhesive type markings applied with methods recommended by the marking's manufacturer.

F. During backfilling of conduit trenches, install continuous underground warning tape directly above line at 6 to 8 inches below finished grade. Use multiple runs of tape where the width of the multiple lines installed in a common trench exceeds 16 inches.

END OF SECTION 260553

SECTION 260923
LIGHITNG CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for time clocks, photocell switches, lighting contactors, occupancy sensors, etc..

1.2 GENERAL

A. Contractor shall furnish and install all lighting controls as called for on plans.

1.3 QUALITY ASSURANCE

A. All devices shall be listed by Underwriters Laboratory, Inc. (UL).

B. All installations shall be in accord with NFPA 70.

1.4 SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors to include field wiring diagrams.

C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

A. Coordinate layout and installation of ceiling mounted devices with other ceiling construction, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Contactors shall be by:

1. Square D

2. G.E.

3. Siemens

4. Cuttler Hammer

B. Photocells shall be by:

1. Tork

2. Intermatic

C. Time clocks shall be by:

1. Tork

2. Intermatic

D. Occupancy sensors shall be by:

1. Leviton

2. Hubbell

3. Douglas

4. Wattstopper

5. Sensor Switch

2.2 CONTACTORS

A. Pole quantities and ratings shall be as required on plans.

B. Coordinate coil voltage with control type and plans.

C. Contactor shall be electrically or mechanically held as required by plans. Contractor shall ensure switching of mechanical contactors uses a momentary on and momentary off signal.

D. Contractor shall have a rating sufficient to withstand the available fault current at the point of installation.

2.3 PHOTOCELLS

A. Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils, and complying with UL 773A.

B. Light-level monitoring range shall be adjustable from 0 to 3500 fc for activation.

C. Device shall have internal time delay to prevent false operation.

D. Indoor ceiling or wall mounting units shall be adjustable for turn-on/turn-off levels, semi flush, calibrated to detect adequacy of day lighting in perimeter locations, and arranged to turn artificial illumination on and off to suit varying intensities of available day lighting.

E. Outdoor sealed units shall be in a weather tight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

F. Devices shall be rated at 1,800 VA tungsten or 1,000 VA inductive load.

2.4 TIME CLOCKS

A. Time clocks shall be solid-state programmable units with alphanumeric display complying with UL 917.

B. Provide enclosure suitable for installed environment.

C. Battery backup (rechargeable) in case of power failure.

G. Contacts are to be rated at 30 Amps.

2.5 OCCUPANCY SENSORS

A. Typical types and locations:

1. Offices, class, break, meeting, conference, and other rooms used for tasks with generally small movements shall utilize dual mode (infrared and ultrasonic) occupancy sensors. Sensors shall be adaptive.

2. Equipment rooms and other storage type rooms shall use infrared types.

3. Restrooms shall use either ultrasonic or infrared type depending on layout of room.

See plans for types, locations, and coverage.

B. Provide adequate quantity of power supplies for low voltage sensors.

C. Sensors shall have an adjustable time delay and a manual “OFF” switch.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install equipment level and plumb and in accord with manufacturer's written instructions.

B. Contactors shall be mounted with vibration isolators to eliminate structure borne vibration.

C. Adjust each occupancy sensor per manufacturer’s suggestions so as to minimize nuisance cycling.

3.2 INSPECTION

A. Verify and test operation of each sensor used. Replace any non-functioning devices.

B. Clean and replace any damaged lenses.

END OF SECTION 260923

SECTION 262200
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes dry-type transformers rated 600 V and less, with capacities up to 1000 kVA.

1.2 QUALITY ASSURANCE

A. All transformers shall be listed and labeled as defined in NFPA 70, by UL.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are:

1. Square D

2. General Electric (GE)

3. Cuttler Hammer

2.2 BUCK – BOOST TRANSFORMERS

A. Transformers shall be self cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer.

B. Cores and windings shall be resin encased.

C. Transformer enclosures shall be NEMA rated per plans and environment. They shall be ventilated with louvers or mesh screens.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Transformers shall be installed with minimum of 6” clearance between ventilation openings and obstructions. Working clearances shall be maintained per NEC.

B. Vibration isolators shall be installed between all transformers and structure. Installation shall provide that load of transformer shall be spread evenly amongst all isolators.

C. Wiring connections to transformers shall be made using flexible metal conduit, sized as appropriate for conductors or equal to rigid conduit size on plans (whichever is greater).

D. Wall hung transformers shall be mounted using factory provided brackets. They shall be hung plumb and level with structure.

3.2 INSPECTION

A. Voltage of transformer secondary shall be measured and adjusted to be equal to nominal voltage rating of secondary taps. At no case shall voltage at transformer secondary be less than 2% rated secondary voltage.

END OF SECTION 262200

SECTION 262416
PANELBOARDS

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for distribution and branch circuit panelboards.

1.2 GENERAL

A. The terms “panelboards” and “loadcenters” are synonymous; see panel schedules to determine construction types.

1.2 SUBMITTALS

A. Product Data: Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes for each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types and details for types other than NEMA 250, Type 1.

3. Detail bus configuration, current, and voltage ratings.

4. Short-circuit current rating of panelboards and overcurrent protective devices.

5. Include evidence of NRTL listing for series rating of installed devices.

6. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.

7. Include wiring diagrams for power, signal, and control wiring.

8. Include coordinated time-current curves for each type and rating of over-current protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of over-current protective device.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of over-current protective device that allows adjustments.

1.4 QUALITY ASSURANCE

A. All panelboards and their assemblies shall be UL listed.

B. All panelboards, overcurrent devices, components, etc. are to be obtained from a single manufacturer.

C. Comply with NFPA 70.

PART 2 – PRODUCTS

2.1 GENERAL

A. All panelboards shall be dead-front, safety type.

B. Circuit breaker panelboards shall have sequence-phased bus bars and molded case circuit breakers. Provide separate ground and neutral busses. Circuit breakers shall be quick-make, quick-break, trip indicating, each pole shall contain thermal and magnetic trip units. Provide 2 and 3 pole circuit breakers with common trip, without relying on handle ties. Submit shop drawings showing cabinet dimensions, circuit breaker electrical ratings and bussing arrangements.

C. Panelboards with aluminum buss are not acceptable.

D. "Wafer" or "Tandem" breakers are not permitted unless specifically called for.

E. Panelboards shall be fully rated to interrupt the available fault current at their terminals.

F. Doors to be secured with keyed latches. All equipment door keys on project are to be alike. Provide double latches for doors measuring more that 36 inches high.

G. All branch circuit breakers shall be bolt-on type.

2.1 MANUFACTURERS

A. Acceptable manufacturers are as follows:

1. Square D

2. General Electric (GE)

3. Cuttler Hammer

PART 3 – EXECUTION

3.1 EXAMINATION

A. Inspect all boards prior to installation. Reject any that show signs of water intrusion.

3.2 INSTALLATION

A. All branch distribution equipments shall be of PANELBOARD or LOADCENTER construction, see schedules for determination.

B. It is not permitted to flush mount panelboards in fire rated walls.

C. Contractor shall install (4) 3/4" conduits into ceiling space for future use where the panelboard is installed flush. These conduits are in addition to conduits required for proposed circuitry. These conduits are required even on installations using cable type (MC, NMC, AC, etc.) wiring methods.

D. All equipment to be set plumb and level.

E. Front covers on flush mounted equipment are to be uniformly flush with wall finish.

F. No equipment to be installed prior to drying-in of equipment spaces.

G. All equipment layouts are to be coordinated with other trades.

H. Any unused spaces shall be filled with manufacturer’s filler plates.

I. Adjust any field adjustable trip settings on overcurrent devices.

3.3 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Test resistance for each panelboard bus, component, connecting supply, feeder, and control ciruit.

C. Test continuity of each circuit.

D. Perform each visual inspection, mechanical inspection, and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Correct any malfunctioning equipment on-site, retest to verify compliance, or replace with new and retest.

E. Prepare inspection test reports. Include any difficiencies found and corrective measures taken.

3.4 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Prior to 60 days of final acceptance by the Owner, measure load balancing and make circuit changes where required. A panel is to be considered not balanced if any of its phase loads differ by more than 20%.

1. Measurements to be taken during normal system loading.

2. Circuit changes are to be made after normal hours of operation.

3. Recheck loading after circuit changes have been made.

END OF SECTION 262416

SECTION 262713
ELECTRICAL METERING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for electrical metering equipment.

1.2 GENERAL

A. Contractor shall coordinate installation of all metering devices with local electric utility company for approved metering types.

1.3 QUALITY ASSURANCE

A. All equipment to be UL listed

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are:

1. Square D
2. General Electric (GE)
3. Cuttler Hammer
4. Millbank

2.2 GENERAL

A. All equipment shall be listed for installation in the proposed environments (NEMA 1, 3R, etc.).

PART 3 – EXECUTION

3.1 INSTALLATION

A. Contractor shall install equipment plumb and level and in accord with utility company requirements.

END OF SECTION 262713

SECTION 262726
WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for receptacles, switches, and other similar devices.

1.2 QUALITY ASSURANCE

A. All products shall be UL listed.

B. All devices are to be obtained from a single manufacturer insofar as they are available.

C. All products shall comply with NFPA 70.

1.3 SUBMITTALS

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

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

PART 2 – PRODUCTS

2.1 WALL SWITCHES

A. Wall switches shall be specification grade, quiet type, high performance switches rated at 20 amps @ 125/277 volts.

B. Switches shall have screw terminals and silver alloy contacts. No push wire connections permitted.

C. Special switches shall be as indicated.

D. Device color selection to be by Architect.

2.2 RECEPTACLES

A. Wall receptacles shall be specification grade, duplex 3-wire grounding type. Devices shall be rated at 15 or 20 amps (see drawing legend), 125 volt. If a single receptacle

serves only one piece of equipment and is fed by a 20 amp or larger breaker, the device shall match the breaker in ampacity.

B. Receptacles shall be side-wired with screw terminals. No push wire connections permitted.

C. Weatherproof receptacles shall have latching, in-use type, hinged, gasketed. Use Thomas & Betts #CKSUV type cast aluminum cover.

D. Special outlets shall be as indicated, or if not indicated, shall be straight-blade type of NEMA configurations according to size and type of branch circuit overcurrent device.

E. Device color selection to be by Architect.

F. Hospital grade receptacles shall be readily identifiable with a green “dot” on the device.

G. Isolated ground type receptacles shall be readily identifiable with an orange triangle on the device.

2.3 WALL PLATES

A. Cover plates for devices shall be of same manufacturer as devices and shall be as indicated in the drawing symbol legend.

B. Color selection is to be by the Architect.

C. Gang plates shall be of one-piece construction.

2.4 MANUFACTURERS

A. Thomas & Betts, Leviton, Pass & Seymour, G.E., Bryant, Hubbell, and Slater are acceptable if they meet requirements of this section. All devices on the project shall be by the same manufacturer.

PART 3 – EXECUTION

3.1 LOCATION OF SWITCHES AND RECEPTACLES

A. Except where noted to contrary, switches and receptacles shall be located as follows: (Dimensions to centerline)

1. Switches at 4'-0", or as noted.

2. Receptacles at 1'-6", or as noted.

3. Telephone, Television, and Computer outlets at 1'-6", or as noted.

4. The Electrical sub-contractor is responsible for coordinating the mounting height of devices above counter tops, wall furniture, etc., with the Architectural plans and or Client/Owner.

B. Switches shall be mounted on strike side of doors, except where structurally impractical. Check Architectural drawings and details to determine actual swing of each door, and locate switches accordingly.

3.2 WALL SWITCHES

A. Switches shall be installed such that they are tight and flat against the wall.

B. Screw terminals shall be utilized. No “push wire” connections are permitted

3.3 RECEPTACLES

A. Switches shall be installed such that they are tight and flat against the wall.

B. Screw terminals shall be utilized. No “push wire” connections are permitted

3.4 WALL PLATES

A. Plates shall be installed so as to be tight and flat against the wall.

B. Contractor shall affix a label to each wall plate indicating the enclosed device circuit of origin. This label shall be placed on the front of wall plate and shall be permanently engraved.

3.5 FIELD QUALITY CONTROL

A. Test receptacle voltage at +/- 10% of nominal voltage.

B. Test resistance to ground to be less than or equal to 2 Ohms.

C. Test all ground fault interrupters.

D. Verify all devices are securely mounting within their boxes.

END OF SECTION 262726

SECTION 262813
FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for cartridge fuses rates 600 Volts and less.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.

b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.

1.3 QUALITY ASSURANCE

A. Fuses are to be obtained from a single manufacturer.

B. All devices are to be UL listed.

C. All devices are to comply with NFPA 70.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Provide products by one of the following:

1. Cooper Bussmann, Inc.

2. Ferraz Shawmut, Inc.

3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Nonrenewable type with Voltage ratings consistent with circuit Voltages.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture or physically damaged.

B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings. Apply as required by manufacturer to obtain fuse rating.

C. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

D. Furnish fuses for fusible equipment. Motor circuit fuses shall be Buss fusetrons rated between 125 and 150 percent of motor name plate rating. Furnish extra set of spare fuses for each switch used.

E. Verify with mechanical equipment shop drawings whether the equipment requires fused disconnects or the use of "HACR" rated breakers is acceptable. In no case shall fused equipment be installed if circuit breakers are prohibited or the use of fused equipment is noted or directed in the drawings.

3.2 FUSE APPLICATION AND TYPE

A. Cartridge fuses are to be rated per the equipment to be protected.

1. Feeders: Class RK5, fast acting

2. Motor branch circuits: Class RK5, time delay

3. Other branch circuits: Class RK5, time delay

3.3 INSTALLATION

A. Install fuses such that rating information is readable without removal of fuse.

END OF SECTION 262813

SECTION 262816
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for enclosed switches and circuit breakers rated 600 Volts and less.

1.2 GENERAL

A. Pull-out type disconnect switches are not acceptable for any installation.

B. Furnish and provide enclosures rated for environments in which they are to be installed.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types.

2. Current and voltage ratings.

3. Short-circuit current ratings (interrupting and withstand, as appropriate).

4. Include evidence of NRTL listing for series rating of installed devices.

5. Detail features, characteristics, ratings, and factory settings of individual over-current protective devices, accessories, and auxiliary components.

6. Include time-current coordination curves (average melt) for each type and rating of over-current protective device; include selectable ranges for each type of over-current protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2. Time-current coordination curves (average melt) for each type and rating of over-current protective device; include selectable ranges for each type of over-current protective device.

1.4 QUALITY ASSURANCE

A. Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Drawings to indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Equipoment to be UL listed.

D. Comply with NFPA 70.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are:

1. Square D.

2. G.E.

3. Cuttler Hammer

2.2 MOLDED CASE CIRCUIT BREAKERS

A. Thermal-Magnetic Circuit Breakers shall have and inverse time-current element for low-level overloads and an instantaneous magnetic trip element for short circuits. Adjustable magnetic trip settings shall be provided for circuit-breaker frame sizes 250 A and larger.

B. Lugs shall be provided that are large enough to accommodate all of the conductors as called for on plans. They shall be of adequate capacity to accommodate hi-press/swaged fittings for any aluminum conductors.

C. Accessories as required by plans:

1. Ground-fault protection shall comply with UL 1053. The trip mechanism shall be integrally mounted, self-powered with mechanical ground-fault indicator. Provide a relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

2. Shunt trip coil energized from separate circuit, 120V AC coil voltage, with clearing contact.

2.2 NONFUSIBLE SWITCHES

A. General duty, single throw, 30 to 60 A shall be, molded case type disconnect switches.

B. General duty, double throw, 100 to 600 A shall be, horsepower rated, lockable handle with capability to accept at least one padlock, and interlocked with cover in closed position.

C. Lugs shall be provided that are large enough to accommodate all of the conductors as called for on plans. They shall be of adequate capacity to accommodate hi-press/swaged fittings for any aluminum conductors.

D. Accessories as required by plans:

1. Equipment ground kit shall be internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral kit shall be internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 262913
ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for electrical motor controllers.

1.2 SCOPE

A. Contractor shall provide all equipment, materials and wiring necessary for complete installation of the systems herein specified and as shown on the plans, as well as those on the mechanical, plumbing, and civil drawings.

1.3 GENERAL

A. Furnish and install power wiring, disconnects, starters, and other devices for all electrically operated equipment furnished by the Owner or other Contractors or as shown on the mechanical, plumbing, and civil plans and the Power Riser Diagram.

B. This Contractor shall refer to other divisions of the specifications and specifically to the mechanical, plumbing, and civil drawings. The Electrical Contractor shall be responsible for all wiring and electrical devices not specifically provided in other divisions.

1.4 SUBMITTALS

A. For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:
   a. Each installed unit's type and details.

   b. Factory-installed devices.

   c. Nameplate legends.

   d. Short-circuit current rating of integrated unit.

   e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to authorities having jurisdiction.

f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.

E. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.

2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.

3. Manufacturer's written instructions for setting field-adjustable overload relays.

F. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

1.5 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of motor starters, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Comply with NFPA 70 as applicable to wiring methods, construction and installation of motor starters.

C. Provide motor starters and components which are UL listed and labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, manufacturers offering motor starters which may be incorporated in the work are:

1. Square D.

2. G.E.

3. Cuttler Hammer

2.2 MOTOR STARTERS:

A. General: Except as otherwise indicated, provide motor starters and ancillary components which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation.

1. Manual motor starters for 120 volts, single phase motors one horsepower and smaller, shall be single pole, horsepower rated switches with thermal overload units and heaters. Starters shall have stainless steel cover plates.

2. Magnetic full voltage starters for single phase motors shall be two pole, horsepower rated, magnetically operated with two thermal overload units and four extra auxiliary contacts. Control voltage shall be 120 volts supplied from a control power transformer where no other supply of 120V control power is indicated. A Hand-Off-Automatic, HOA switch shall be mounted in front cover. Starters shall have pilot lights indicating RED = OFF and GREEN = ON.

3. Magnetic full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated with three thermal overload units and four extra auxiliary contacts. Control voltage shall be 120 volts supplied from a control power transformer where no other supply of 120V control power is indicated. A Hand-Off-Automatic, HOA switch shall be mounted in front cover. Starters shall have pilot lights indicating RED = OFF and GREEN = ON.

4. Combination magnetic, full voltage starters for three phase motors shall be three pole horsepower rated, magnetically operated switches, with three thermal overload units and four extra auxiliary contacts. Control voltage shall be 120 volts supplied from a control power transformer where no other supply of 120V control power is indicated. A three pole horsepower rated, non fusible disconnect switch shall also be included in the enclosure. An HOA switch shall be mounted in front cover. Starters shall have pilot lights indicating RED = OFF and GREEN = ON.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

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

3.2 INSTALLATION

A. Install motor starters as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL and NEMA standards, to insure that products fulfill requirements.

B. Motor and equipment locations indicated on the drawings are approximate only. Actual locations must be confirmed on the job site before conduits are installed. Coordinate all motor and equipment exact locations with the mechanical drawings and mechanical shop drawings as well as the civil drawings and civil shop drawings.

C. Equipment connections shall include but not necessarily be limited to those noted on the drawings.

D. All motors shall be fed with flexible conduit as noted on the drawings and specifications with appropriate connectors. Provide and install a separate bond conductor, sized from N.E.C. Table #250-122 in all flexible conduits to motors or equipment.

E. Install fuses in control circuits if not factory installed. Comply with requirements in Division 26 Section "Fuses."

F. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic- control devices that have no safety functions when switch is in manual-control position.

2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment test and adjust controllers, components, and equipment.

2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.

3. Test continuity of each circuit.

4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).

5. Test each motor for proper phase rotation.

6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect before increasing settings.

3.7 PROTECTION

A. Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

END OF SECTION 262913

SECTION 264113
LIGHTNING PROTECTION FOR STRUCTURES

PART l - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for lightning protection systems.

1.2 SCOPE

A. Intent of the lightning protection systems shall be to protect the building against damage by lightning. All equipment to that result shall be included whether or not specifically called for herein. The installing contractor's superintendent of the project shall be an LPI (lightning Protection Institute) certified master installer in accordance with LPI Standards. The contractors installers shall be LPI journeymen certified or of equal qualifications as approved by Engineer.

B. A U.L. Master Label for the system and a witness of grounding form, similar to that required by LPI (form 175-A), shall be required.

1.3 DESCRIPTIONS OF SYSTEM

A. Lightning Protection Systems shall be installed on the structure by experienced installers in compliance with provisions of Code for Lightning Protection Systems as adopted by the National Fire Protection Association (NFPA-780) and Underwriters Laboratories.

B. Materials shall comply in weight, size and composition with the requirements of Underwriters Laboratories and the National Fire Protection Code for Class I lightning protection system installation and shall be U.L. Labeled; except provide materials complying with Class II lightning protection systems as specified herein or as detailed on the drawings.

1.4 SUBMITTALS

A. Shop Drawings shall be submitted before work is started. Drawings shall include full layout of cabling, air terminals, bonding points, and connections.

B. Product Data shall be submitted on all equipment to show compliance with this section of the specifications and shall include manufacturers written recommendations for installation.

1. Provide a letter from the roof system manufacturer stating that the proposed adhesive for the lightning protection system is approved compatible with the roofing materials and that its use will not affect the roofing system warranty.

PART 2 - PRODUCTS

2.1 AIR TERMINALS

A. Air Terminals shall be solid copper except provide aluminum terminals on aluminum roof structures as detailed (aluminum roof ventilators, etc.) and shall have proper base support for the surface on which they are attached and shall be securely anchored to this surface. Terminals shall project a minimum of 18" above top of object to which attached.

2.2 CONDOCTORS

A. Roof conductors shall be copper except provide aluminum conductors where protecting aluminum roof structures as detailed (bonding to aluminum ventilators and other aluminum structures, etc.). Conductors shall comply with weight and construction requirements of the Code for Class II lightning protection systems and shall be coursed to interconnect with air terminals. Provide minimum type C-385 weight copper conductor for main conductor. Conductors shall provide a two-way (minimum) path to ground. The angle of any turn shall not exceed 90 degrees, and shall provide an approximately horizontal or downward course. Down conductors shall be copper, and shall be installed in PVC conduit and hidden within the structure. Approved bimetal transitions from aluminum roof conductors to copper conductors shall be provided where required. Radius of bends shall not be less than 8 inches.

2.3 FASTENERS

A. Conductor fasteners shall be of the same material as the conductor, having ample strength to support conductor. Where fasteners are to be mounted in masonry or structural work, they shall be furnished to the Masonry or Structural Contractor so they may be installed during construction of the project.

B. Adhesive for securing adhesive bases to the roof system shall be approved by the roof system manufacturer.

2.4 GROUND CONNECTIONS

F. Ground connections shall be made in accordance with requirements of all applicable codes. The down conductors and grounding electrode system shall be in accordance with NFPA-780 and UL-96.

2.5 MANUFACTURERS

A. Equipment shall be as manufactured by

1. Thompson Lightning Protection, Inc.

2. Independent Protection Company, Inc.

3. Heary Bros. Lightning Protection

4. Harger (premium line)

5. East Coast Lightning Protection Equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be made in an inconspicuous manner with conductors coursed to conceal equipment as much as possible. All metallic equipment within 6 feet of any lightning conductor shall be bonded to conductor.

END OF SECTION 264113

SECTION 264313

SURGE PROTECTIVE DEVICES FOR LOW VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for surge protective devices.

1.2 WORK INCLUDED

A. The work required under this section shall include all materials, labor and auxiliaries required to furnish and install complete surge suppression for the protection of building electrical and electronics systems from the effects of line induced transient voltage surge and lightning discharge as indicated on drawings or specified in this section.

B. Related work specified elsewhere:

1. COMMON WORK RESULTS FOR ELECTRICAL

2. GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1.3 QUALITY ASSURANCE

A. All surge protective devices shall be manufactured by a company normally engaged in the design, development, and manufacture of such devices for electrical and electronics systems equipment.

B. The surge protective devices manufacturer shall offer technical assistance through support by a factory representative and local stocking distributor.

C. Items shall be listed by Underwriters' laboratories, shall bear the UL seal and be marked in accordance with referenced standard.

D. Surge protective devices shall be installed and located in accordance with requirements of all applicable National Fire Protection Association (NFPA) Codes.

1.4 WARRANTY

A. All surge protective devices shall be warranted to be free from defects in materials and workmanship under normal use in accordance with the instructions provided for a period of five years.

B. Any surge protective devices which shows evidence of failure or incorrect operation during the warranty period shall be repaired or replaced by the manufacturer and installer.

1.5 CODES AND STANDARDS

A. The following standards and publications are referenced in various parts of this specification and shall apply:

1. UL 1449 – Standard for Surge Protective Devices

2. UL 1363 - Standard for Relocatable Power Taps - 2007

3. UL 1283 - Standard for Safety for Electromagnetic Interference Filters - 1998

3. ANSI/IEEE C62.41-1980 (IEEE 587) - Guide for Surge Voltages in Low-Voltage AC Power Circuits.

4. ANSI/IEEE C62.33-1982 - Standard Test Specifications for Varistor Surge Protection Devices.

5. ANSI/IEEE C62.45-1987 - IEEE Guide for Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

1.6 SUBMITTALS

A. Schematic data on each suppressor type indicating component types.

B. Dimensioned drawing of each suppressor type.

C. Manufacturer's performance data on each suppressor type to include short circuit rating, voltage protection rating for all modes, maximum continuous operating voltage, I-nominal rating, and Type 1 device listing.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Surge protective devices shall be by:

1. Atlantic Scientific

2. LEA International

3. Advanced Protection Technologies (APT)

B. See plans for locations and required protection levels.

2.2 COMMON REQUIREMENTS

A. Surge protective devices for flush mounted panelboards shall be within or flush mounted alongside the panelboard.

B. Surge protective devices shall have an operating temperature range of -40 degrees C to +85 degrees C.

C. Surge protective devices, if not plug-on type shall be close nippled to the device being protected in a position which will minimize lead length between suppressor and the buses or control breaker to which the suppressor connects. Suppressor leads shall not extend beyond the suppressor manufacturer's recommended maximum lead length without specific approval of the Engineer.

D. Surge protective devices shall be designed for the specific type and voltage of electrical service and shall provide clamping action for line to neutral and line to ground.

E. Surge protective devices shall be of a modular hybrid design unless specified otherwise.

F. Surge protective devices shall be designed to withstand a maximum continuous operating voltage of not less than 115% of nominal RMS line voltage.

G. Surge protective devices shall contain internal safety fusing which is designed to disconnect the suppressor from the electrical source if the suppressor fails.

H. Surge protective devices shall be failsafe, shall have repeated surge capability, shall be solid state, shall be self-restoring, and shall be fully automatic.

I. Surge protective devices shall contain a visual indication at the suppressor to verify that either the suppressor has failed or that the suppressor is operational and functional.

J. Surge protective devices shall be UL 1449 listed and shall be approved for the location in which they are installed.

PART 3 - EXECUTION

3.1 REQUIRED SUPPRESSORS

A. Provide surge protective devices for the equipment described herein:

1. Main service entrance equipment, provide 2 or 3 (as applicable) pole 30 Amp overcurrent protection for the device.

2. Downstream panelboard/s as indicated on the drawings, provide 2 or 3 (as applicable) pole 30 Amp circuit breakers ahead of the device.

3. Other loads as required by plans.

B. Surge protective devices shall be installed at the first switchboard, service disconnect, or panelboard, etc., the service conductors encounter as they enter the building.

3.1 INSTALLATION

A. Surge protective devices shall be installed as close as practical to the electric panel or electronic equipment to be protected, consistent with available space. Similarly, the branch circuit breaker shall be located as close to the surge protective device as possible.

B. Surge protective devices shall be installed in a neat manner. Lead dress shall be as short and as straight as possible and be consistent with recommended industry practices for the system on which these devices are installed.

C. Supplementary grounding and bonding connections required between the bonding bus or ground and other locations as indicated herein shall be accomplished using #6 AWG core copper conductor and approved connections unless otherwise noted. Referenced to a common earth ground.

END OF SECTION 264313

SECTION 265100
INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for interior normal and emergency light fixtures, lamps, ballasts, and illuminated egress signs.

1.2 GENERAL

A. Fixtures have been designated in accordance with fixture schedule located on the drawings. If any fixture is not clearly identified, Contractor shall request clarification from the Engineer.

B. Contractor shall supply replacement lamps as follows:

1. Linear fluorescent: One lamp per every two fixture lamps.

2. Compact fluorescent: One complete set of replacement lamps.

3. Incandescent lamps: One complete set of replacement lamps.

4. HID lamps: One complete set of replacement lamps.

1.3 QUALITY ASSURANCE

A. Provide and install, in satisfactory operating condition, lighting fixtures (including lamps and auxiliaries) as indicated or required for a complete and operable lighting system.

B. All light fixtures shall be listed be Underwriters Laboratories, Inc (UL).

C. Contractor shall submit full shop drawings of all light fixtures proposed. Shop drawings shall include fixture manufacturer cut sheets with all options clearly indicated, photometric plot, efficiency, light fixture sectional views, lamp types, ballast types, etc..

D. Light fixtures shall be evaluated for equality based upon features such as construction, materials, lensing, lamping, ballast, color, finish, performance, etc.. If prior approval has not been granted, in writing, for substitution of a light fixture, and in the opinion of the Engineer or Architect, a fixture does not meet the requirements of the design said fixture shall be replaced with an acceptable fixture at no additional cost to the Owner.

E. Upon request, contractor shall furnish full size, fully operational samples of any light fixture to Engineer and/or Architect.

F. All fixtures to comply with NFPA 70.

1.4 SUBMITTALS

A. For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.

2. Emergency lighting units including battery and charger.

3. Ballast.

4. Energy-efficiency data.

5. Life, output, and energy-efficiency data for lamps.

6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this project.

a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.

b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Efficient Lighting Products.

B. Warranties

PART 2 – PRODUCTS

2.1 LIGHTING FIXTURES

A. Light fixtures shall be as specified on Electrical or Architectural plans. Contractor shall issue the entire light fixture schedule (part numbers and description) to lighting supplier for take-offs. In addition, a full size print of the lighting plan shall also be furnished. If any conflicts or discrepancies are located, contractor shall immediately notify the Engineer and Architect and get written clarification. “Cross Over” fixture packages are allowed, however, alternate packages must be submitted for review and approval, by the Engineer and Architect, at least 10 days prior to bid. Verify from light fixture schedule as to whether “Prior Approvals” are or are not required for submission. Note that all alternate packages are subject to rejection by Engineer or Architect.

B. Fluorescent fixtures shall be provided with approved spacers where mounted on combustible ceilings, or be approved for such installation.

C. Fluorescent fixtures shall have ELECTRONIC ballasts bearing stamp of approval of both ETL-CBM, and Underwriters Laboratories, Inc. Pigtail mounted fuses shall be provided and installed with every ballast including mercury, metal halide, and H.P.S. types. Compact fluorescent (PL and TRT) lamp ballasts are exempted. Two foot (2'), three foot (3'), and four foot (4') fluorescent lamps shall be T8 unless noted otherwise. All fluorescent lamps shall be of the same color temperature and rendering index, these shall be 3500 K and 85% unless noted otherwise on Architectural or Electrical plans.

D. All lamp sockets shall have silver-plated contacts

E. Adjustable lighting fixtures intended to produce a desired lighting effect shall be so adjusted in full cooperation with Architect. In event such adjustment need be made at night, Contractor shall make arrangements necessary to accomplish desired result without extra charge for overtime.

F. Recessed lighting fixtures installed in contact with insulation shall be AIC≅ type.

G. Provide all required rings, trims, hangers, clips, etc. for a complete installation.

H. Warranties

1. For emergency lighting unit batteries, ten years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

2. For electronic ballasts, five years from date of Substantial Completion.

3. For fluorescent lamps, one year from date of Substantial Completion.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Fixtures shall be set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Fixtures to be supported independently of ceiling membranes.

C. Clean and touch up all fixture reflectors, lenses, and housings after installation and lamping.

D. All discharge (fluorescent, metal halide, etc.) lamp colors in the same space are to be the same temperature.

E. Adjust any aimable fixtures as necessary.

3.2 INSPECTION

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Interrupt power supply to each emergency light fixture to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

END OF SECTION 265100

SECTION 265600
EXTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements and specifications for interior normal and emergency light fixtures, lamps, ballasts, and illuminated egress signs.

1.2 GENERAL

A. Fixtures have been designated in accordance with fixture schedule located on the drawings. If any fixture is not clearly identified, Contractor shall request clarification from the Engineer.

B. Contractor shall supply replacement lamps as follows:

1. Linear fluorescent: One lamp per every two fixture lamps.

2. Compact fluorescent: One complete set of replacement lamps.

3. Incandescent lamps: One complete set of replacement lamps.

4. HID lamps: One complete set of replacement lamps.

1.3 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4.

B. Pressure of wind on pole and luminaire, calculated and applied as stated in AASHTO LTS-4.

1. Wind speed for calculating wind load for poles 50 feet or less in height is 130 mph.

1.4 QUALITY ASSURANCE

A. Provide and install, in satisfactory operating condition, lighting fixtures (including lamps and auxiliaries) as indicated or required for a complete and operable lighting system.

B. All light fixtures shall be listed be Underwriters Laboratories, Inc (UL).

C. Contractor shall submit full shop drawings of all light fixtures proposed. Shop drawings shall include fixture manufacturer cut sheets with all options clearly indicated, photometric plot, efficiency, light fixture sectional views, lamp types, ballast types, etc..

D. Light fixtures shall be evaluated for equality based upon features such as construction, materials, lensing, lamping, ballast, color, finish, performance, etc.. If prior approval has not been granted, in writing, for substitution of a light fixture, and in the opinion of the Engineer or Architect, a fixture does not meet the requirements of the design said fixture shall be replaced with an acceptable fixture at no additional cost to the Owner.

E. Upon request, contractor shall furnish full size, fully operational samples of any light fixture to Engineer and/or Architect.

F. All fixtures to comply with NFPA 70.

G. Submit photometric plan of site with all exterior light fixtures for review.

1.5 SUBMITTALS

A. For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.

2. Emergency lighting units including battery and charger.

3. Ballast.

4. Energy-efficiency data.

5. Life, output, and energy-efficiency data for lamps.

6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this project.

a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.

b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Efficient Lighting Products.

7. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4 and that load imposed by luminaire has been included in design.

8. Warranties

PART 2 – PRODUCTS

2.1 LIGHTING FIXTURES

A. Light fixtures shall be as specified on Electrical or Architectural plans. Contractor shall issue the entire light fixture schedule (part numbers and description) to lighting supplier for take-offs. In addition, a full size print of the lighting plan shall also be furnished. If any conflicts or discrepancies are located, contractor shall immediately notify the Engineer and Architect and get written clarification. "Cross Over" fixture packages are allowed, however, alternate packages must be submitted for review and approval, by the Engineer and Architect, at least 10 days prior to bid. Verify from light fixture schedule as to whether "Prior Approvals" are or are not required for submission. Note that all alternate packages are subject to rejection by Engineer or Architect.

B. Fluorescent fixtures shall be provided with approved spacers where mounted on combustible ceilings, or be approved for such installation.

C. Fluorescent fixtures shall have ELECTRONIC ballasts bearing stamp of approval of both ETL-CBM, and Underwriters Laboratories, Inc. Pigtail mounted fuses shall be provided and installed with every ballast including mercury, metal halide, and H.P.S. types. Compact fluorescent (PL and TRT) lamp ballasts are exempted. Two foot (2'), three foot (3'), and four foot (4') fluorescent lamps shall be T8 unless noted otherwise. All fluorescent lamps shall be of the same color temperature and rendering index, these shall be 3500 K and 85% unless noted otherwise on Architectural or Electrical plans.

D. All lamp sockets shall have silver-plated contacts

E. Adjustable lighting fixtures intended to produce a desired lighting effect shall be so adjusted in full cooperation with Architect. In event such adjustment need be made at night, Contractor shall make arrangements necessary to accomplish desired result without extra charge for overtime.

F. Recessed lighting fixtures installed in contact with insulation shall be IC type.

G. Provide all required rings, trims, hangers, clips, etc. for a complete installation.

H. Warranties

1. Warranty period for luminaires is to be five years from date of Substantial Completion.

2. Warranty period for metal corrosion is to be five years from date of Substantial Completion.

3. Warranty period for color retention is to be five years from date of Substantial Completion.

4. Replace any lamps and/or fuses that fail within 12 months from date of Substantial Completion.

5. Repair or replace any lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

I. Pole mounted fixtures shall have poles and bases (as required) designed to meet the wind loading of the jurisdiction where installed. Contractor shall very this information and provide documentation to Engineer and Architect.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Fixtures shall be set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Fixtures to be supported independently of ceiling membranes.

C. Poles shall be set plumb.

D. Clean and touch up all fixture reflectors, lenses, and housings after installation and lamping.

E. Adjust any aimable fixtures as necessary.

3.2 POLE INSTALLATION

A. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Install 10’ ground rod at each pole. Connect to pole’s internal lighting protection conductor. This is for lightning protection of pole. Fixture is not to be grounded to this rod.

C. Contractor shall coordinate all locations of light poles with local utilities and site/civil engineering. This included final heights, placement, and burial depth.

D. Direct burial for poles

1. Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.

2. Dig holes large enough to permit use of tampers in the full depth of hole.

3. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

E. Raise and set poles using web fabric slings (not chain or cable).

3.3 INSPECTION

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Interrupt power supply to each emergency light fixture to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

END OF SECTION 265600

SECTION 270500
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 TELEPHONE & DATA COMMUNICATIONS

A. Work under this section includes:

1. A completely installed system of empty conduits run to a flush 4" square deep junction box at each outlet indicated on the drawings homerun to the telephone terminal board; OR

2. Conduit stub from outlet to accessible ceiling space. (See drawings for design).

3. Install pull string into all empty conduits.

B. This contractor shall provide a suitable raceway of PVC from the site telephone terminal to the building telephone terminal board as shown on the drawings. A 3/4" thick plywood board painted gray with fire retardant paint shall be installed for terminal equipment by others. Verify board size. Service conduit shall be 2" PVC minimum, one (1) required if not noted otherwise.

C. The local telephone company shall be contacted after contract award and at start of construction for designation of the service point on the property line.

D. Contractor to provide grounding terminal and ground conductor bonded to main electrical service ground per NFPA 70.

E. Telephone outlets, as indicated on the drawings by the telephone symbol, shall be flush 2-gang boxes with a 1-gang plaster ring. Raceway is to be one or more 3/4" EMT conduit(s) as required by plans. See specific notes on drawings for conduits, device, plate, and cable details.

F. See plans as to whether the system is to be a full conduit system with home runs or conduit to accessible ceiling space wiring to be run loose using plenum or non-rated type cable.

G. If cabling is not installed, provide pull wire in all empty conduit.

H. General Contractor shall verify that owner has information technology (IT) specialist for consult regarding specific telecommunications equipment, requirements, capacities, etc.. If owner does not have an IT specialist on hand, GC shall facilitate involvement of a Building Industry Consulting Services, International (BICSI) registered Registered

Communications Distribution Designer (RCDD) for. The owners It specialist or RCDD shall establish all communications based equipment specifications and provide said equipment in accord with owner's requirements. All work by IT specialist or RCDD shall be closely coordinated with the installation of conduit, boxes, or terminal boards under this section.

I. Install telephone service conduit/s from property line in 2" PVC conduit or as indicated to designated terminal area. Coordinate with Telephone Company for service point.

J. Coordinate with division 26 for identification and markings requirements of telephone and data conduits and cabling.

1.2 TELEVSION COMMUNICATIONS

A. Work under this section includes:

1. A completely installed system of individual unit conduits run to a flush 4" square deep junction box with 1-gang plaster ring at each outlet indicated on the drawings, OR

2. Conduit stubs from outlet to accessible ceiling space.

3. See drawings to determine if signal cable is required; if required, install Radio Frequency coaxial cable, type RG- 6/U, from outlet to TV terminal board.

4. If no cable is required, install pull string into conduit.

B. This contractor shall provide a suitable raceway of PVC from the site television terminal to the building telephone terminal board area as shown on the drawings. A 3/4" thick plywood board painted with fire retardant gray, shall be installed for terminal equipment by others, unless noted otherwise the board shall be 24" wide by 48" high.

Service conduits shall be 2" PVC, one (1) required if not noted otherwise.

C. Television outlet devices shall be, indicated by the TV symbol, are to be 2-gang deep boxes, flush mounted, with one gang plaster rings. Raceway to be 1/2" EMT conduit.

D. Install television (CATV) service conduit/s from property line in 2"PVC, or as indicated to designated terminal area. Coordinate locations and requirements with franchised service provider.

E. Coordinate with division 26 for identification and markings requirements of CATV conduits and cabling.

1.2 SUPERVISION

A. Maintain competent Superintendent in charge of work. Superintendent shall be qualified and have suitable experience in type of work involved.

B. Should he be deemed not capable by Architect, he shall be replaced immediately by a Superintendent who is satisfactory. After a satisfactory Superintendent has been assigned, he shall not be withdrawn without consent of Architect.

1.3 WORKMANSHIP

A. Materials and equipment shall be installed in a neat and industry standard manner as judged by the Engineer of Record.

B. Architect reserves right to direct removal and replacement of items which, in his opinion, do not present an orderly and reasonably neat appearance provided such as orderly installation can be made using customary trade methods. The removal and replacement shall be done when directed in writing by Architect at sub-contractor's expense and without additional expense to Owner.

1.4 CONNECTING TO WORK OF OTHERS

A. Before starting his work and from time to time as work progresses, the sub-contractor's superintendent shall examine work and materials installed by others insofar as they apply to his own work, and shall notify the Architect immediately in writing of conditions which will prevent satisfactory results from the installation of the system.

B. Should the Communications subcontractor start his work without proper notification, it shall be construed as an acceptance by him of all conditions and as to suitability of the work of others to receive his work.

1.5 CONSTRUCTION DRAWINGS

A. The contract drawings indicate the extent and the general conditions of the work. If any departures from the contract drawings are deemed necessary by the sub-contractor, details for such departures and the reasons therefore shall be submitted to the Engineer immediately.

B. These items shall be submitted, in writing, for approval. No such departure shall be made without prior written approval of the Architect and Engineer.

C. The drawings are diagrammatic and indicate the general arrangement of fixtures, equipment and work included in the contract. Consult the architectural drawings and details for exact location of fixtures and equipment.

D. The sub-contractor shall follow the drawings in laying out work and check the drawings of other trades to verify spaces in which work will be installed. Maintain head room and space conditions at all points. Where head room or space conditions appear inadequate, notify the Architect before proceeding with the installation.

E. Likewise, the sub-contractor shall follow the drawings in laying out work and coordinate with the drawings of other trades to verify locations for all equipment on site. Maintain proper clearances from new or existing utilities or structures. The sub-contractor is responsible for coordinating any requirements of local utilities. Where space or clearance conditions appear inadequate, notify the Architect before proceeding with the installation.

F. If directed by the Architect, the sub-contractor shall, without extra charge, make reasonable modifications (as judged by Architect) in the layout and installation of the electrical equipment, fixtures, and devices as needed to prevent conflict with work of other trades (whether on site or within structure); to prevent conflict with new or existing utilities (whether on site or within structure); or for proper execution of the work.

1.6 DAMAGE TO OTHER WORK AND PERSONNEL

A. Each sub-contractor shall be responsible for proper protective measures when working overhead or in finished areas. He shall repair, replace, or touch up finished surface which may be damaged as a result of his work or operations. This is to include preparation, priming, and refinish of structure due to welding or machining for attachment of electrical equipment.

B. Subcontractor shall carry suitable insurance as prescribed by law for protection of his employees, other persons, materials and equipment on site.

1.7 CUTTING, PATCHING, AND EXCAVATIONS

A. Cutting and patching of walls, partitions, floors, concrete, pits and chases in wood and masonry will be done by this sub-contractor as indicated or as directed by Architect. Cutting of steel, wood, or other main structural parts must be approved by Architect prior to commencing cutting.

B. Sub-contractor shall do necessary excavation and back-filling for his own work.

1.8 REMOVAL OF RUBBISH

A. Subcontractor shall maintain premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work he shall remove tools, scaffolding, materials and rubbish from building site, and leave premises and his work in a clean, orderly, and acceptable condition.

1.9 ORDINANCES AND REGULATIONS

A. If the work as laid out, indicated, or specified is contrary to, or conflicts with codes ordinances or regulations, the sub-contractor shall report same to Architect before submitting his bid. Architect will issue instructions as to procedure.

1.10 PERMITS AND FEES

A. The General Contractor shall insure that the necessary permits and inspections required for his work are obtained. He shall deliver to Architect certificates of inspection issued by authorities having jurisdiction.

1.11 SCHEDULES AND MATERIALS

A. Materials and equipment are specified herein by a single or by multiple manufacturers, to indicate quality, material, and type of construction desired. One Manufacturer's product is indicated and has been used as basis for design; it shall be each Subcontractor's responsibility to ascertain that alternate Manufacturer's products conform to detailed specification, and that size and arrangement of equipment is suitable for installation. Products of other Manufacturer's will be considered for use if in the Engineer's opinion, item requested for substitution is equal to that specified. Should a Subcontractor desire to make a substitution, he should apply in writing, stating amount of credit or extra involved, including complete Engineering data.

B. It shall be the responsibility of each sub-contractor making a substitution to include costs for changes required by other trades for proper operation of equipment proposed to be substituted.

C. Before purchase of equipment, submit shop drawings for approval. Submit as complete as possible. Identify each item submitted. Information on shop drawings shall contain all that is necessary to show that equipment complies with specifications and drawings. Show required modifications. One complete set of approved shop drawings shall be kept at job site.

NOTE: All submittals of electrical materials or equipment shall be made at the same time contained within one binder and one letter of transmittal.

D. See Architectural front end requirements for shop drawing procedures.

E. Provide shop drawings for the following:

1. Any and all Electronics including SPD (Surge Protection devices)

2. Wire & cable

3. Conduit & fittings

4. All associated systems equipment

5. All devices

F. Corrections or comments made on shop drawings during review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with design concept of project, and general compliance with information given in contract documents.

G. All materials and equipment furnished under this contract shall bear the label of approval of the Underwriters Laboratory, Inc. (UL).

1.12 CLEANING AND ADJUSTMENTS

A. Upon completion of work, each sub-contractor shall clean, oil, and grease fans, motors, and other running equipment and apparatus which he installs, and shall make certain such apparatus and mechanisms are in proper working order and ready for test.

1.11 INSTRUCTIONS

A. Each sub-contractor shall furnish (3) complete sets of operations and maintenance instructions applying to each piece of equipment installed in conjunction with this contract.

1.12 GUARANTEE AND SERVICE

A. In addition to guarantee of equipment by manufacturer of each piece of equipment specified herein, each sub-contractor shall also guarantee such equipment and make good any defect of material or workmanship occurring during a period of (1) year from final acceptance test, without expense to Owner.

B. Each Subcontractor shall service systems for (1) year from final acceptance. Such service will include lubrication, necessary adjustment, and/or replacement of defective equipment and materials furnished. Incandescent light bulb (incandescent only) replacement guarantee shall be limited to 30 days, H.I.D. and fluorescent lamps at 180 days after final acceptance.

1.13 CODES AND INSPECTIONS

A. Work shall comply with:

1. National Electric Code (2008 edition)

2. O.S.H.A. Standards

3. State of Florida ADA Handicap Requirements

4. 2007 State of Florida Building Code including the 2009 amendments.

5. Other Standards so adopted by the Florida Building Code.

1.14 SCOPE

A. Furnish labor, materials, and equipment necessary for a complete and workable system and installation.

1.15 STORAGE OF MATERIALS

A. Prior to and during installation, store materials to protect them from injury or deterioration. Material shall not be stored in contact with ground or floor. If suitable storage areas are not available at job site, provide temporary construction or store material off-site in suitable warehouses. Do not remove manufacturer's packing materials until ready to install.

1.16 ACCEPTANCE INSPECTION

A. Contractor shall read applicable sections of these specifications, and prepare and assemble required test reports, maintenance manuals, certificates, guarantees and letters of instruction. Contractor's representatives responsible for work under Division 16 shall be present at time of acceptance inspections, and shall furnish required mechanics, tools, and ladders to assist in inspection.

B. Prior to requesting final inspection, the sub-contractor shall clean, and where required, paint electrical equipment installed. Exposed conduits, exposed outlet boxes, surface panel cabinets, etc. shall be finished to match walls or ceilings. Cabinets, panels, panel covers, scratched or otherwise damaged shall be painted with factory supplied color-matched paint. Interiors of panelboards, switchboards and cabinets shall be vacuumed, free of dust and debris.

C. List of items to be corrected as a result of acceptance inspection will be furnished to the Architect for transmittal to the General Contractor.

D. Notify Architect in writing of items appearing on list for correction which are disputed by the sub-contractor. When ready, request in writing a re-inspection of work. Should items on the rejection list remain uncorrected, additional inspections required to ascertain completion shall be paid by Contractor to the Engineer at current billing rates of the Engineer.

1.17 CONTINUITY OF SERVICE

A. Uninterrupted use of existing facility must be continued during the entire time required for the installation of equipment and work required under this contract. This shall be applicable to all communications systems involved in this contract such as telecommunications and television.

B. Contractor shall perform all work so as to maintain the lowest possible amount of "down time." Connections to existing services or equipment, change of service, or any other work that will require periods of "down time," shall be scheduled and performed after hours so as to prevent "down time."

C. If after-hour work is not acceptable to client/owner, contractor may opt to schedule "down time" with the owner. This "down time" shall be schedule a minimum of 48 hours in advance of the proposed interruption.

1.18 REMOVAL OF EXISTING CIRCUITRY

A. Where existing devices are to be removed during construction (or demolition), all fixtures, conduits, boxes, and wiring (not required to maintain continuity of service) shall be completely removed.

B. Any removed equipment of value shall be given to the owner for storage. Contractor shall otherwise be responsible for disposal of demolished equipment and materials.

1.19 EXISTING BUILDING EQUIPMENT

A. Contractor shall disconnect and remove all existing equipment within an area of renovation, unless specifically required to remain or to maintain continuity of service. If the plans require the installation of a new receptacle, light fixture, or other device in a location where an existing device is installed, the contract may re-use the existing conduit and boxes.

1.20 COORDINATION

A. It shall be the responsibility of the contractor to coordinate the installation details of all equipment and devices. This shall include all devices within structures, on exterior of

structures, or on site.

B. Contractor is encouraged to mach up equipment (along with other trades) in areas expected to be “tight” prior to actual installation to judge fit and make adjustments accordingly.

C. The contractor shall periodically inspect the installations of other trades (HVAC, plumbing, fire protection, etc.) and notify the General Contractor, Architect, and Engineer of any conflicts with electrical systems.

D. Any courses of action taken to accommodate conflicts after-the-fact shall not be considered as “extra services” and will not be subject to additional billings as such.

END OF SECTION 270500

SECTION 280500
COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes the requirements and specifications for fire alarm systems.

1.2 SYSTEM DESCRIPTION

A. The Contractor shall furnish, install and place in operating condition an electrically operated, closed circuit, supervised fire alarm system. All units of equipment shall be located as shown on the plans and wired in accordance with the manufacturer's instructions to make a complete and workable system as hereinafter described.

B. The operation of any manual fire box or automatic alarm initiating device shall sound a continuous audible and visual alarm at all signal devices until the alarm initiating device has been restored to normal and a reset switch manually activated at the control panel. The operation of any alarm initiating device shall light a common red alarm lamp. Each smoke detector, heat detector, water flow switch, pull station, and tamper switches shall light a separate annunciator lamp at the control unit. Tamper switches shall not cause an alarm condition, only a trouble indication.

C. Each and every device which can initiate an alarm condition shall be separately annunciated at the main alarm panel and/or a separate annunciator panel as indicated on the plans.

D. Operating and supervising power shall be 120 volt AC.

E. Provisions and equipment shall be made in the alarm equipment to provide signals to a remote bonded security monitoring company via telephone lines of "trouble" and alarm conditions. Notification equipment is to be part of the Alarm System.

1.3 QUALITY SASSURANCE

A. General Contractor shall facilitate involvement of a Fire Alarm Contractor with adequate experience designing and installing fire alarm systems of this type.

B. Installation shall be conducted by persons certified by NICET as fire alarm Level II technicians.

C. All equipment to be UL listed for fire alarm signaling use.

D. All equipment to be obtained from a single source manufacturer.

E. Installation is to be per NFPA 70 and NFPA 72.

F. Test, Guarantee, and Drawings

1. The Contractor shall conduct tests of the system in the presence of the Owner or his agent and Fire Department Officials having jurisdiction. All material and installation shall be guaranteed to be free of defects in material and workmanship for one (1) year. The Contractor shall turn over to the Owner a complete set of system wiring diagrams and maintenance data. Provide complete wiring diagrams for this specific project with shop drawings.

2. Included with the alarm system shall be a one (1) year service, inspection, and maintenance agreement with a recognized alarm service organization which shall provide the Owner with once per month inspection and check-out and service, labor and parts as required to maintain a fully operable alarm system for a period of one (1) year with no cost to the Owner during this period.

1.4 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Beginning with Substantial Completion, provide software support for two years.

C. Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.5 SUBMITTALS

A. The Fire Alarm System sub-contractor shall provide six (6) sets of shop drawings of the proposed system to the Engineer for review and approval. All submittals of electrical materials or equipment shall be made at the same time contained within one binder and one letter of transmittal. The drawings shall indicate;

1. Locations and types of all devices.

2. Any and all Electronics including TVSS (Surge Protection devices)

3. Intensity of all signaling devices.

4. Manufacturer's data for all devices.

5. All circuit wiring with conductor size and quantity.

B. The Engineer's contract drawings indicate the extent and the general conditions of the work. If any departures from the contract drawings are deemed necessary by the sub-contractor, details for such departures and the reasons therefore shall be submitted to the Engineer immediately.

C. These items shall be submitted, in writing, for approval. No such departure shall be made without prior written approval of the Architect and Engineer.

D. The drawings are diagrammatic and indicate the general arrangement of fixtures, equipment and work included in the contract. Consult the architectural drawings and details for exact location of fixtures and equipment.

E. The sub-contractor shall follow the drawings in laying out work and check the drawings of other trades to verify spaces in which work will be installed. Maintain head room and space conditions at all points. Where head room or space conditions appear inadequate, notify the Architect before proceeding with the installation.

F. Likewise, the sub-contractor shall follow the drawings in laying out work and coordinate with the drawings of other trades to verify locations for all equipment on site. Maintain proper clearances from new or existing utilities or structures. The sub-contractor is responsible for coordinating any requirements of local utilities. Where space or clearance conditions appear inadequate, notify the Architect before proceeding with the installation.

G. If directed by the Architect, the sub-contractor shall, without extra charge, make reasonable modifications (as judged by Architect) in the layout and installation of the electrical equipment, fixtures, and devices as needed to prevent conflict with work of other trades (whether on site or within structure); to prevent conflict with new or existing utilities (whether on site or within structure); or for proper execution of the work.

H. Corrections or comments made on shop drawings during review do not relieve contractor from compliance with requirements of drawings and specifications. This check is only for review of general conformance with design concept of project, and general compliance with information given in contract documents.

I. It shall be the responsibility of each sub-contractor making a substitution to include costs for changes required by other trades for proper operation of equipment proposed to be substituted.

1.6 ORDINANCES AND REGULATIONS

A. If the work as laid out, indicated, or specified is contrary to, or conflicts with codes ordinances or regulations, the sub-contractor shall report same to Architect before submitting his bid. Architect will issue instructions as to procedure.

B. Work shall comply with:

1. NFPA 70 (2008 edition)

2. O.S.H.A. Standards

3. State of Florida ADA Handicap Requirements

4. 2010 State of Florida Building Code.

5. Other Standards so adopted by the Florida Building Code.

1.7 PERMITS AND FEES

A. The General Contractor shall insure that the necessary permits and inspections required for his work are obtained. He shall deliver to Architect certificates of inspection issued by authorities having jurisdiction.

1.8 GUARANTEE AND SERVICE

A. In addition to guarantee of equipment by manufacturer of each piece of equipment specified herein, each sub-contractor shall also guarantee such equipment and make good any defect of material or workmanship occurring during a period of (1) year from final acceptance test, without expense to Owner.

B. Each Subcontractor shall service systems for (1) year from final acceptance. Such service will include lubrication, necessary adjustment, and/or replacement of defective equipment and materials furnished. Incandescent light bulb (incandescent only) replacement guarantee shall be limited to 30 days, H.I.D. and fluorescent lamps at 180 days after final acceptance.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to the requirements of the project, equipment shall be provided from one of the following:

1. Pyrotronics

2. Notifier

3. Honeywell

4. Firelite

5. Simplex

6. Edwards

B. Materials and equipment are specified herein by a single or by multiple manufacturers, to indicate quality, material, and type of construction desired. One Manufacturer's product is indicated and has been used as basis for design; it shall be each Subcontractor's responsibility to ascertain that alternate Manufacturer's products conform to detailed specification, and that size and arrangement of equipment is suitable for installation. Products of other Manufacturer's will be considered for use if in the Engineer's opinion, item requested for substitution is equal to that specified. Should a Subcontractor desire to make a substitution, he should apply in writing, stating amount of credit or extra involved, including complete Engineering data.

2.2 CONTROL UNIT

A. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies. Include a real-time clock for time annotation of events on the event recorder and printer.

B. The control unit shall be of dead front construction containing all relays, printed circuit boards, terminal strip connection, annunciator lamps and other component parts necessary to operate the system as hereinafter specified. All relays shall be interchangeable, plug-in type enclosed in protective dust covers. The control unit shall contain internal trouble signal with associated silencing switches, amber trouble lamp and red alarm lamps.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 40 characters, minimum.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Circuitry to be as indicated on plans. Install no more than 50 addressable devices on each signaling line circuit.

E. A single open in the station or detector circuits shall cause a trouble signal and shall not prevent an alarm from being sounded when any initiating device is actuated nor prevent alarm lamp from illuminating. Failure of the system operating power, an open or ground in the signal circuits or alarm initiating circuits shall initiate a trouble signal and illuminate an amber trouble lamp. Trouble signals when silenced shall ring back when the trouble condition is restored to normal. System operating controls shall include a system test switch, a reset switch and trouble signal silencing switch.

2.3 STAND-BY BATTER SUPPLY

A. Provide a battery charger/transfer module complete with transfer circuitry.

B. Provide standby power battery module complete with sealed, rechargeable, 24 Volt batteries providing operation times required by N.F.P.A. 72 1-5.2.6.

2.4 HEAT DETECTORS

A. Thermal detectors shall be combination rate-of-rise/fixed temperature rated 190 degrees F. and contain replaceable thermal elements. A quantity of 20% of installed detectors of spare elements shall be provided for Owner use.

2.5 MANUAL PULL STATIONS

A. Manual fire boxes shall be non-coded semi-flush mounted in finished areas and surface mounted in unfinished areas. Pull stations shall be double action with key or wrench reset. Construction shall be die cast non ferrous metal, with red finish, instructions to be in raised white lettering. If stations contain glass rods, glass or plastic windows, etc. which are destroyed when station is activated, a quantity if (25) spare breakables shall be provided the Owner for each station installed. Stations shall be located in accordance with N.F.P.A. 72 and N.F.P.A. 101. Weatherproof stations shall have factory fabricated enclosed hinged at top to permit lifting.

2.6 SIGNALING DEVICES

A. Shall be flush or semi-recessed DC type combination vibrating horns and flashing strobe lights and be ADA approved. Flashing strobe lights shall have candella ratings as noted, when two or more strobes are within visual sight, they shall be synchronized.

B. Spacing and location of A/V signals shall comply with N.F.P.A. 72 and A.D.A. requirements.

2.7 WATER FLOW AND TAMPER SWITCHES

A. These devices are to be furnished and installed by the Fire Sprinkler Contractor and connected to the alarm system by the Fire Alarm Contractor.

B. If the project s sprinkled, there will be waterflow and tamper switches. The Contractor shall verify location and quantity including the site located PIV of other shut-off valve and provide for connections to the system.

2.8 SMOKE DETECTORS

A. Shall be photocell type with dual lamps (L.E.D. type) with auxiliary contacts to provide annunciation and to control other functions such as fan shut-down.

B. Duct type smoke detectors shall have an auxiliary control panel for test and alarm indication, auxiliary contacts for fan shutdown through control relays if required. Duct detectors are required in all return air ducts of HVAC systems having 2000 CFM and greater capacity and in all air handling units, regardless of installed fan speed/setting. Detectors are to be provided and installed by the Division 23 Contractor. Division 28 Contractor shall coordinate all details of installation (manufacturer, model, etc.) so as to ensure system compatibility.

2.9 ADDRESSABLE INTERFACE DEVICES

A. Microelectronic monitor module, for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTERS

A. Digital alarm communicator transmitter shall be acceptable to the supervising station and shall comply with UL 632.

B. Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

1. Local functions and display at the digital alarm communicator transmitter shall include verification that both telephone lines are available, programming device, LED display, manual test report function and manual transmission clear indication, and communications failure with the central station or fire-alarm control unit.

C. Digital data transmission shall include the address of the alarm-initiating device, address of the supervisory signal, address of the trouble-initiating device, loss of ac supply or loss of power, low battery, abnormal test signal, and communication bus failure.

D. Integral rechargeable battery and automatic charger.

E. Conducted automatically every 24 hours with report transmitted to supervising station.

2.11 DEVICE GUARDS

1. Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection. Factory fabricated and furnished by manufacturer of device. Paint of color to match the protected device.

2.12 INSTRUCTIONS

A. Each sub-contractor shall furnish (3) complete sets of operations and maintenance instructions applying to each piece of equipment installed in conjunction with this contract.

2.13 EXISTING BUILDING EQUIPMENT

A. Contractor shall disconnect and remove all existing equipment within an area of renovation, unless specifically required to remain or to maintain continuity of service. If the plans require the installation of a new receptacle, light fixture, or other device in a location where an existing device is installed, the contract may re-use the existing conduit and boxes.

PART 3 – EXECUTION

3.1 STORAGE OF MATERIALS

A. Prior to and during installation, store materials to protect them from injury or deterioration. Material shall not be stored in contact with ground or floor. If suitable storage areas are not available at job site, provide temporary construction or store material off-site in suitable warehouses. Do not remove manufacturer's packing materials until ready to install.

3.2 INSTALLATION

A. Alarm Signals

1. Each occupied space, corridor, or other spaces shall have a flush mounted speaker or speakers as shown on the plans.

2. All toilet rooms shall have audible and visual ADA approved signals.

3. Duct type smoke detectors shall have an auxiliary control panel for test and alarm indication, auxiliary contracts for fan shutdown thru control relays if required Duct detectors are required in all supply air ducts of HVAC systems having greater capacity than 2,000 CFM.

4. Spacing and location of A/V signals shall comply with N.F.P.A. 72 and A.D.A. requirements.

B. Workmanship

1. Materials and equipment shall be installed in a neat and industry standard manner as judged by the Engineer of Record.

2. Architect reserves right to direct removal and replacement of items which, in his opinion, do not present an orderly and reasonably neat appearance provided such as orderly installation can be made using customary trade methods. The removal and replacement shall be done when directed in writing by Architect at sub-contractor's expense and without additional expense to Owner.

3. Coordinate with division 26 for identification and markings requirements of fire alarm conduits and cabling.

C. Connecting to work of others

1. Before starting his work and from time to time as work progresses, the Electrical sub-contractor's superintendent shall examine work and materials installed by others insofar as they apply to his own work, and shall notify the Architect immediately in writing of conditions which will prevent satisfactory results from the installation of the system.

2. Should the Electrical subcontractor start his work without proper notification, it shall be construed as an acceptance by him of all conditions and as to suitability of the work of others to receive his work.

3.3 FIELD QUALITY CONTROL

A. SUPERVISION

1. Maintain competent Superintendent in charge of work. Superintendent shall be qualified and have suitable experience in type of work involved.

2. Should he be deemed not capable by Architect, he shall be replaced immediately by a Superintendent who is satisfactory. After a satisfactory Superintendent has been assigned, he shall not be withdrawn without consent of Architect

B. REMOVAL OF EXISTING CIRCUITRY

1. Where existing devices are to be removed during construction (or demolition), all fixtures, conduits, boxes, and wiring (not required to maintain continuity of service) shall be completely removed.

2. Any removed equipment of value shall be given to the owner for storage. Contractor shall otherwise be responsible for disposal of demolished equipment and materials.

C. COORDINATION

1. It shall be the responsibility of the electrical contractor to coordinate the installation details of all electrically operated equipment and devices. This shall include all light fixtures and other devices within structures, on exterior of structures, or on site.

2. Contractor is encouraged to mach up equipment (along with other trades) in areas expected to be “tight” prior to actual installation to judge fit and make adjustments accordingly.

3. The electrical contractor shall periodically inspect the installations of other trades (HVAC, plumbing, fire protection, etc.) and notify the General Contractor, Architect, and Engineer of any conflicts with electrical systems.

4. Any courses of action taken to accommodate conflicts after-the-fact shall not be considered as “extra services” and will not be subject to additional billings as such.

3. DAMAGE TO OTHER WORK AND PERSONNEL

1. Each sub-contractor shall be responsible for proper protective measures when working overhead or in finished areas. He shall repair, replace, or touch up finished surface which may be damaged as a result of his work or operations. This is to include preparation, priming, and refinish of structure due to welding or machining

for attachment of electrical equipment.

2. Subcontractor shall carry suitable insurance as prescribed by law for protection of his employees, other persons, materials and equipment on site.

D. CUTTING, PATCHING, AND EXCAVATIONS

1. Cutting and patching of walls, partitions, floors, concrete, pits and chases in wood and masonry will be done by this sub-contractor as indicated or as directed by Architect. Cutting of steel, wood, or other main structural parts must be approved by Architect prior to commencing cutting.

2. Sub-contractor shall do necessary excavation and back-filling for his own work.

E. REMOVAL OF RUBBISH

1. Subcontractor shall maintain premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work he shall remove tools, scaffolding, materials and rubbish from building site, and leave premises and his work in a clean, orderly, and acceptable condition.

F. CLEANING AND ADJUSTMENTS

1. Upon completion of work, each sub-contractor shall clean, oil, and grease fans, motors, and other running equipment and apparatus which he installs, and shall make certain such apparatus and mechanisms are in proper working order and ready for test.

3.4 FIELD TESTING

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the “Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test audible appliances for the private operating mode according to manufacturer's written instructions.

5. Test visible appliances for the public operating mode according manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

D. Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. One year after date of Substantial Completion, test fire alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.5 ACCEPTANCE INSPECTION

A. Contractor shall read applicable sections of these specifications, and prepare and assemble required test reports, maintenance manuals, certificates, guarantees and letters of instruction. Contractor's representatives responsible for work under Division 26 shall be present at time of acceptance inspections, and shall furnish required mechanics, tools, and ladders to assist in inspection.

B. Prior to requesting final inspection, the sub-contractor shall clean, and where required, paint equipment installed. Exposed conduits, exposed boxes, surface panel cabinets, etc. shall be finished to match walls or ceilings. Cabinets, panels, panel covers, scratched or otherwise damaged shall be painted with factory supplied color-matched paint. Interiors of cabinets shall be vacuumed, free of dust and debris.

C. List of items to be corrected as a result of acceptance inspection will be furnished to the Architect for transmittal to the General Contractor.

D. Notify Architect in writing of items appearing on list for correction which are disputed by the sub-contractor. When ready, request in writing a re-inspection of work. Should items on the rejection list remain uncorrected, additional inspections required to ascertain completion shall be paid by Contractor to the Engineer at current billing rates of the Engineer.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire alarm system.

END OF SECTION 280500