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Facility Expansion/Renovation for: CLEVELAND EYE & LASER SURGERY CENTER

Fairview Corporate Center

Fairview Park, Ohio

DSCA Project No.: 11.058

Project Manual

Permit Issue Date: April 14, 2011



SECTION 000001 - PROJECT TITLE PAGE

Project: **Facility Expansion/Renovation for:
Cleveland Eye and Laser Surgery Center**
Building-A Fairview Corporate Park
22715 Fairview Center Drive
Fairview Park, Ohio

Owner: **Cleveland Eye and Laser Surgery Center LLC**
3401 Enterprise Parkway, Suite 300
Beachwood, OH 44122

BID ISSUE
Issued April 14, 2011

DESIGN TEAM:

Architect: **Davison Smith Certo Architects, Inc.**
26031-B Center Ridge Road
Westlake, Ohio 44145
TEL: (440) 835-3957
FAX: (440) 835-4042

Mechanical Engineer: **Denk Associates, Inc.**
503 East 200th Street
Cleveland, OH 44119
TEL: (216)531-8880
FAX: (216)531-5144

Electrical Engineer: **Denk Associates, Inc.**
503 East 200th Street
Cleveland, OH 44119
TEL: (216)531-8880
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SECTION 000100 - NOTICE TO BIDDERS

PART 1 - GENERAL

1.1 NOTICE

- A. Notice is hereby given that sealed proposals from invited bidders for the Cleveland Eye and Laser Surgery Center, Fairview Park, Ohio, will be received by the Architect, Davison Smith Certo Architects, Inc., 26031-B Center Ridge Road, Westlake, Ohio 44145.

1.2 PROJECT

- A. Title: Facility Expansion/Renovation for:
Cleveland Eye and Laser Surgery Center
Building-A Fairview Corporate Center
22715 Fairview Center Drive
Fairview Park, Ohio
- B. Description: The work of this contract shall consist of furnishing of all labor and materials for the interior construction for the expansion and renovation of an Ambulatory Surgery Center for eye and laser surgery as depicted in the contract documents.
- C. Owner: Cleveland Eye and Laser Surgery Center, LLC
3401 Enterprise Parkway, Suite 300
Beachwood, OH 44122
Representative: Mr. Warren Laurita
- D. Architect: Davison Smith Certo Architects, Inc.
26031-B Center Ridge Road
Westlake, Ohio 44145
Phone: (440)835-3957
Fax: (440)835-4042
e-mail: mail@dscarchitects.com

1.3 BIDDING

- A. Bid due date: **Friday, 4/29/2011 - Noon**
- B. Bids shall be submitted to the Architect.
- C. Bid opening will be private.
- D. Documents:
1. Each invited bidder will be issued one (1) set of pdf. contract documents. Additional sets may be obtained at the bidder's expense through Lakeside Blueprint, 29225 Center Ridge Road, Westlake, OH 44145, (440)835-2343.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000100

000200 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Bidding documents include the Notice to Bidders, Instructions to Bidders, Summary of Work, the Bid Form, Contract Agreement Forms and the Contract Documents, including any Addenda or Revised Bid Forms issued prior to receipt of Bids.
- B. All definitions included in the General Conditions or in other Contract Documents apply to all Bidding Documents.
- C. Addenda are written or graphic instruments issued by the Architect prior to the execution of the contract which modify or interpret the bidding documents by additions, deletions, clarifications and corrections.
- D. A Bid is a completed and properly signed Bid Form in which the Bidder proposes to perform the work or designated portion of the work of the sum or sums stipulated therein and supported by information called for by the Bidding Documents.
- E. An alternate Bid is an amount stated the Bid to be added to or subtracted from the amount of the Base Bid if the corresponding change in the scope of the Work or products or methods of execution of the Work described in the Bidding Documents is accepted by the Owner.

1.2 BIDDERS REPRESENTATION

- A. Each Bidder, in submitting his Proposal, represents that he has read and understands the Bidding Documents and that his Bid is made in accordance therewith.
- B. Each Bidder represents that he has visited the Site, familiarized himself with the local conditions under which the Work is to be performed, compared the Site with the Drawings and Specification, satisfied himself of the conditions of delivery, handling and storage of material, and all other matters that may be incidental to the Work, before submitting his proposal.
- C. Each Bidder represents that his Bid is based upon the materials and equipment described in the Bidding Documents without defined exceptions.
- D. Submission of a Proposal will be considered as evidence of the Bidder's Representation. No allowance will subsequently be made to the successful Contractor by reason of any error or omission on his part, due to his neglect in complying with the requirements of this Article.

1.3 BIDDING PROCEDURES

- A. Sealed Bids for furnishing all labor and material for the construction of the Project will be received by the Architect at the time, date, and place indicated in the Notice to Bidders.
- B. All blank spaces on the Bid Form shall be filled in by typewriter or in ink.
- C. All Bids must be prepared on the Bid Form provided by the Architect, or an exact copy of it.
- D. All copies of the Bid, the Bid Security, if any, and other documents required to be submitted with the Bid shall be addressed to the party receiving the Bid and shall be identified with the project Name

and the Bidder's Name and Address. If the Bid is sent by mail, the sealed envelope should be marked with the notation "BID ENCLOSED" on the face thereof.

- E. A Bid is invalid if it has not been deposited at the designated location prior to the time and date for receipt of Bids indicated in the Notice, or prior to any revision thereof issued to the bidders.
- F. No bidder shall modify, withdraw or cancel his Bid or any part thereof for sixty-days (60) after the time designated for the receipt of Bids in the Notice.
- G. In case of a difference of sums in written words and figures on the Bid Form, that amount stated in written words shall govern.
- H. Any interlineation, alteration or erasure on the Bid Form must be initialed by the signer of the Bid.
- I. Bidder shall make no additional stipulation on the Bid Form or qualify his Bid in any other manner.
- J. Each copy of the Bid shall include the legal name of the Bidder and a statement whether Bidder is a sole proprietor, a partnership, a corporation or any other legal entity, and each copy shall be signed by the person, or persons legally authorized to bind the bidder to a Contract.
- K. Modification or Withdrawal of Bid:
 - 1. A Bid may not be modified, withdrawn or cancelled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids. Bidder so agrees in submitting his Bid.
 - 2. Prior to the time and date designated for receipt of Bids, bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time and date designated for receipt of Bids.
 - 3. Such notice shall be given in writing over the signature of the Bidder.
 - 4. Withdrawn Bids may be resubmitted up to the time designated for the receipt of the Bids provided that they are then fully in conformance with these Instructions to Bidders.
 - 5. Bid security, if any is required, shall be in the amount sufficient for the Bid as modified or resubmitted.
- L. Oral Bids are invalid and will not receive consideration.
- M. Bids can be sent via facsimile as long as they are received prior to the bid deadline. Inability to connect to receiver's fax line will not be cause for deadline extension.
- N. In the event that the bids exceed the amount which the Owner will consider for the construction of the project, the Owner reserves the right to negotiate with any of the bidders submitting a bid in attempts to bring the project within budget. it would be the Owner's intention to request such Bidder to submit alternates which may reduce the total cost of the Project to an amount which the Owner can accept.

1.4 EXAMINATION OF THE BID DOCUMENTS

- A. Each Bidder shall examine the Bidding Documents carefully and, not later than seven days prior to the date for receipt of Bids, shall make written request to the Architect for interpretation or correction of any ambiguity, inconsistency, or error therein which he may discover upon examination of the Bidding Documents or of the site and local conditions. Any interpretation change, or correction will be issued as an Addendum by the Architect. Only interpretation, change, or correction by an Addendum shall be binding. No Bidder shall rely upon any interpretation, change or correction given by another method.
- B. The specifications and Drawings are intended to describe and illustrate a complete job in every respect; however, it is impossible to describe or show all of the incidental work and items which may be required during the course of construction. Contractors are required to familiarize themselves

with the conditions existing on the site. Additional costs will not be accepted for incidental work and/or materials not indicated but required to produce the desired results.

1.5 ADDENDA

- A. Prior to the receipt of Bids, Addenda will be forwarded to all invited Bidders by the Architect, and will be available for inspection wherever the Bidding documents are on file for that purpose.
- B. Addenda issued during the time of Bidding shall be listed on the Bid Form in the space provided.
- C. No Addenda will be issued during the one (1) day immediately preceding the Bid Date.

1.6 REJECTION OF BIDS

- A. The Bidder acknowledges the right of the Owner to reject any or all Bids without cause or reason and to waive any informality or irregularity in any Bid received without obligation. In addition, the Bidder recognizes the right of the Owner to reject a Bid if the Bidder fails to submit the data required by the Bidding Documents, or if the Bid is in any way incomplete or irregular.

1.7 PERFORMANCE AND PAYMENT BOND

- A. Upon execution of the Agreement, the Owner may require the Contractor to furnish to the Owner a Performance and Payment Bond covering the faithful performance of the Contract and the payment of all obligations arising thereunder with such sureties secured through sources agreeable to the Owner. The Performance and Payment Bond shall be made out for one hundred percent (100%) of the Contract Amount.
- B. The Performance and Payment Bond format shall be AIA Document A311 as published by the American Institute of Architects, modified if necessary to comply with applicable statutes. The Bond shall be signed by an official of the Bonding Company and shall be accompanied by a certified and current copy of bonding agent's power of attorney, indicating the monetary limit of such power. Provide five (5) copies of each of bonds and the power of attorney.
- C. Each bidder shall indicate separately in his Bid the total cost of the premiums for the Performance and Payment Bond. If the Bond is required by the Owner, the cost of such Bond shall be paid by the Contractor and will be reimbursed by the Owner.

1.8 PROPOSED SUB-CONTRACTORS

- A. The Contractor shall submit, as part of his bid a list of the Subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for such portions of the Work as may be designated in the bidding documents or, if no portions are so designated, the Subcontractors proposed for the principal portions of the Work.
- B. The Bidder will be required to establish, to the satisfaction of the Architect and the Owner, the reliability and responsibility of the proposed Subcontractor to furnish and perform the Work described in the Sections of the Specifications pertaining to such proposed Subcontractor's respective trades.
- C. Prior to execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or the Architect, after due investigation, has reasonable and substantial objection to any person or organization on such list.

- D. If the Owner or the Architect has a reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization, the Bidder may, at his option, withdraw his Bid without forfeiture of Bid Security, or submit an acceptable substitute contractor with an increase in his Bid price to cover the difference in cost occasioned by such substitution.
- E. The Owner may, at his discretion, accept the increased Bid price or he may disqualify the Bidder.
- F. Subcontract and other persons and organizations proposed by the Bidder and accepted by the Owner and the Architect must be used on the Work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner and the Architect.

1.9 PROJECT SCHEDULE

- A. The Contractor shall submit, as part of his bid package, a comprehensive horizontal bar-type schedule for the construction of the project indicating anticipated phasing and time frames to meet the project requirements.
 - 1. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 2. Milestones: Indicate key project milestones incorporating the Project Schedule Requirements indicated.

1.10 SCHEDULE OF VALUES

- A. Bidders are to include a Schedule of Values, AIA Document G703 with their bid. Line items to be included on Schedule of Values are to be the items applicable to the scope of work required for this project taken from the Master Schedule of Values included at the end of this section.

1.11 TOTAL PROJECT SCOPE

- A. The scope of the project includes all work depicted and described in the bid documents and specifications.

1.12 TAXES

- A. Materials purchased for use or consumption in connection with the proposed work are subject to State of Ohio and local sales and/or use tax.
- B. Purchases by the Contractor of expendable items such as tools, fuel, or equipment rentals shall be subject to taxation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000200

SECTION 000400 - BID FORM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

- A. All bids are to be submitted on the Bid Form that follows this Section.
- B. Bidders are to complete the Bid Form in its entirety, leaving no blank spaces on form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000400

BID FORM
Facility Expansion/Renovation for:
Cleveland Eye and Laser Surgery Center
Building-A Fairview Corporate Center
22715 Fairview Center Drive
Fairview Park, Ohio

Submitted by _____

on _____ 20____

Having read and examined the Contract Documents, including without limitation the Drawings and Specifications prepared by Davison Smith Certo Architects, Inc., 26031-B Center Ridge Road, Westlake, Ohio, for the above referenced project, and having inspected the existing site affecting and governing the construction of said project, the undersigned Bidder proposes to furnish all materials and perform all labor in accordance with the Contract Documents, for the following sums:

A. PHASE 1 - BASE BID

Phase 1 Construction of an expansion to the Cleveland Eye and Laser Surgery Center as indicated in the contract documents.

_____ Dollars (\$ _____)

B. PHASE 2 - BASE BID (non-concurrent)

Phase 2 Construction of an expansion to the Cleveland Eye and Laser Surgery Center as indicated in the contract documents. Construction of Phase 2 is to be completed as a completely separate job at a time to be decided. Pricing is to reflect current market conditions.

_____ Dollars (\$ _____)

C. PHASE 2 - CREDIT (concurrent construction)

Credit (deduct amount) if Phase 1 and Phase 2 are completed at the same time (concurrent).

_____ Dollars (\$ _____)

D. ALTERNATE #1

Cost for power doors and hardware to match existing doors located between Operating rooms and Clean Utility/Sterile Processing room.

_____ Dollars (\$ _____)

E. PERFORMANCE AND PAYMENT BOND

At the request of the Owner a Performance and Payment Bond made out for one hundred percent (100%) of the **Phase 1 Total Project Cost** will be provided for the cost of:

_____ Dollars (\$ _____)

F. ADDITIONAL WORK

Any additional work or changes to the work of this Contract shall be paid for as stated in item entitled "Changes" of the General Conditions. Contractor hereby states that he will do such additional work for _____% (_____ percent) for overhead and _____% (_____ percent) for profit.

G. ADDENDA

All addenda, revised Drawings and Bulletins issued have been included in this bid and are listed below.

| <u>Addendum No.</u> | <u>Issue Date</u> |
|---------------------|-------------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

H. TAX

In submitting this Proposal the contractor stipulates that all applicable federal, state and local taxes are included in the bid.

J. RIGHTS OF THE OWNER

In submitting this Proposal it is understood that the right is reserved by the Owner, in its sole discretion, to accept any bid, and the right to reject any and all bids, or part of any bid. The Bidders, by the filing of bids hereunder, shall acquire no rights whatsoever against the Owner. It is further agreed that this Proposal may not be withdrawn for a period of thirty (60) days after the bid opening date, without the consent of the Owner.

K. CONDITIONS AND EXCLUSIONS

Respectfully submitted,

Firm Name: _____

Authorized Signature: _____

Print Name: _____

Title: _____

Official Address: _____

Date: _____

SECTION 000500 - FORM OF AGREEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

- A. AIA Document A101 - 1997, "Standard Form of Agreement Between Owner and Contractor", as published by the American Institute of Architects, is hereby made a part of the Project Manual and will be the form of contract for the project. A copy of this document is available at the Architect's office for review. In submitting a bid, the Bidder affirms that they have reviewed and accept A IA Document A101 - 1997, "Standard Form of Agreement Between Owner and Contractor", as published by the American Institute of Architects, as the form of agreement for the project.
- B. As discussed in Article 5.1.6.1 and 5.1.6.2, a retainage of ten percent (10%) will be applied to Progress Payments for work completed and stored on the Project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000500

SECTION 000700 - GENERAL CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

- A. AIA Document A201 - 1997, "General Conditions of the Contract for Construction", as published by the American Institute of Architects, and as modified by the following 'Supplementary Conditions to the General Conditions of the Contract', is hereby made a part of the Project Manual. A copy of this document is available at the Architect's office for review. In submitting a bid, the Bidder affirms that they have reviewed and accept AIA Document A201 - 1997, "General Conditions of the Contract for Construction", as published by the American Institute of Architects, as part of the project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000700

**SUPPLEMENTARY CONDITIONS
TO THE GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION**

The following items supplement or modify AIA Document A201 - General Conditions of the Contract for Construction:

ARTICLE 1: GENERAL PROVISIONS

- 1.2.4 (new) By entering into agreement the Contractor indicates that the Construction Documents are sufficient to complete the work of the project and that they are skilled in the construction of facilities similar in scope to this project.
- 1.2.5 (new) If conflicting information is provided in the Construction Documents or if it is apparent that additional information is required, the Contractor is to notify the Architect immediately. If conflicting information relates to the quality or methods of work indicated, Contractor is to provide methods of higher quality or quantity unless noted otherwise.
- 1.2.6 (new) The Contractor is to be familiar with all project information included in the drawings and specifications for the project and is responsible for coordination of work provided by Subcontractors of different trades.

ARTICLE 2: OWNER

- 2.1.3 (new) Owner's Representative shall be Mr. Warren Laurita.
- 2.2.5 Delete paragraph. Contractor is responsible to provide copies of drawings and specifications required for completion of the project.

ARTICLE 3: CONTRACTOR

- 3.2.4 (new) Contractor indicates that it has examined all documentation regarding the project and become familiar with the conditions of the site including the information provided in the contract documents.
- 3.4.5 (new) Contractor shall make efforts to conduct project operations in a manner to minimize the opportunity for labor disputes for the duration of the project. Additional compensation will not be provided for any loss of time or incurred cost attributed to labor disputes.
- 3.7.6 (new) Contractor is to provide all certificates of inspection and occupancy permits directly to Owner.
- 3.9.2 (new) Contractor's project superintendent shall be acceptable to Owner. Project superintendent shall not be replaced through the duration of the project without the consent of the Owner.
- 3.13.2 (new) Contractor shall conduct operations in a manner to minimize any effect on neighboring properties except as specifically may be required to complete the work of the project.
- 3.15.3 (new) Contractor shall coordinate all construction activities with owner and provide the appropriate phasing as required for continuous uninterrupted operation of the existing

facility.

- 3.15.4 (new) Contractor to keep all dust and debris from entering sterile areas of the facility. If any dust or debris enters sterile areas, the contractor shall notify facility administrator immediately. If contamination occurs after hours, the contractor is responsible for notifying the administrator in person prior to start of the next business day.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

- 4.3.10 Delete the last sentence of this section, beginning with "Nothing contained in this section..."
- 4.3.11 (new) Under no circumstances shall the Contractor be entitled to additional compensation or damages due to project delays. Extension of the contract schedule shall be the exclusive remedy to any request for additional time.
- 4.5 Mediation - Delete this entire section.
- 4.6 Arbitration - Delete this entire section

ARTICLE 5: SUBCONTRACTORS

- 5.4.2 Delete Paragraph.

ARTICLE 6: CONSTRUCTION BY OWNER OR OTHER SUBCONTRACTS

- 6.2.6 (new) Contractor is responsible for any claims made by other Subcontractors against the Owner due to damage caused by the Contractor.

ARTICLE 8: DELAYS AND EXTENSION OF TIME

- 8.3.3 Delete entire paragraph.

ARTICLE 9: PAYMENTS AND COMPLETION

- 9.2.2 (new) Contractor is to submit schedule of values using AIA Document G703, Application and Certificate for Payment, Continuation Sheet or reasonable duplication.
- 9.3.4 (new) Contractor is to submit Certificate and Applications for Payment using AIA Document G702 or reasonable duplication.
- 9.3.5 (new) Included with each Application and Certificate for Payment the Contractor is to submit a conditional waiver stating that upon receipt of the requested payment, the Contractor and its associated Subcontractors will waive, release and relinquish any and all mechanic's lien or claims or the rights thereof on the portion(s) of work included in the Application and Certificate for Payment. The waiver is to cover all labor, services, equipment and or

materials furnished included in the application.

- 9.8.6 (new) Contractor is to notify Architect when project is substantially complete and a Certificate of Occupancy has been received from the authority having jurisdiction. Contractor is to verify in writing that all required permit, inspection and occupancy fees have been paid. Certificate of Occupancy is to be forwarded to Owner.

ARTICLE 11: INSURANCE & BONDS

11.1.4 (new) Contractor is to carry insurance in compliance with the minimum requirements as follows:

- (1) Comprehensive General Liability insurance including products liability coverage, completed operations liability coverage and contractual liability coverage (Broad Form) with minimum limits of liability of \$1,000,000.00 annual aggregate.
- (2) Comprehensive Automobile Liability insurance coverage with minimum limits of liability of \$1,000,000.00 each person, \$5,000,000.00 each occurrence.
- (3) Comprehensive property and casualty insurance coverage with minimum limits of liability of \$1,000,000.00 each occurrence and \$1,000,000.00 annual aggregate.
- (4) Umbrella or Excess Liability Insurance coverage with minimum limits of liability of \$5,000,000.00 each occurrence and \$5,000,000.00 annual aggregate.
- (5) Workers compensation insurance to statutory limits on all employees engaged in the work.

11.1.5 (new) In submitting a bid proposal for the project, the Contractor states that he has secured all insurance required by law and as indicated in the contract documents. Evidence for this insurance is to be provided upon request of the Owner. Any change in the Contractor's insurance coverage including but not limited to changes in limits, carrier or cancellation is to be provided to Owner not less than thirty (30) days prior to effective date of the change.

11.1.6 (new) Contractor's insurance carrier(s) are to have an A.M. Best Co. rating of A or A+ and be acceptable to Owner.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.3.2 (new) Contractor is to copy Owner's representative on all written communications between Architect and Contractor as directed by Owner's representative.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Work covered by the Contract Documents.
- 2. Type of the Contract.
- 3. Work under other contracts.
- 4. Owner-furnished products.
- 5. Use of premises.
- 6. Work restrictions.

- B. Related Sections include the following:

- 1. Division 01 Section "Multiple Contract Summary" for division of responsibilities for the Work.
- 2. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Cleveland Eye & Laser Surgery Center.

- 1. Project Location: 22715 Fairview Center Drive, Fairview Park, Ohio.

- B. Owner: Cleveland ASC Real Estate, LLC

- 1. Owner's Representative: Mr. Warren Laurita.

- C. Architect: Davison Smith Certo Architects, Inc.
26031-B Center Ridge Road
Westlake, OH 44145

- D. Contractor: To be determined.

- E. The Work consists of the following:

- 1. The Work includes the 2,217 s.f. interior construction expansion and renovation of an existing Ambulatory Surgery Center.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with other separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

1.6 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated on drawings. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections where indicated.
1. Owner may arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
 2. After delivery, Owner may inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
 3. At time of delivery, if Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
 4. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
 5. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
 6. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
 7. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
 8. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 9. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

1.7 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations within work limits, including use of Project site, during construction period. Contractor's use of premises is limited by Owner's right to perform work or to retain other contractors on portions of Project. Contractor to coordinate phasing with tenant prior to start of construction.
- B. Use of Site: Limit use of premises to areas within the Contract limits. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building during construction period.

1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: All construction activities should be coordinated with existing facility administrator prior to start of construction. The existing facility may require limited work times as to not disturb the operation of the facility. Work shall be generally performed during normal business working hours permitted by local authorities, except as otherwise directed.
1. Weekend Hours: Working hours permitted by local authorities, except as otherwise directed.
 2. Early Morning Hours: Working hours permitted by local authorities, except as otherwise directed.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's written permission.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012900 - PAYMENT PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submission of initial Applications for Payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.

- b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submission.
2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
- a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
- 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
- a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The period covered by each Application for Payment is one month, ending on the last day of the month.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submission of first Application for Payment include the following:

1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Submittals Schedule (preliminary if not final).
 5. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Related Sections include the following:
 - 1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Startup and adjustment of systems.
 7. Project closeout activities.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
 3. Number of Copies: Submit one electronic mailed copy in Adobe Acrobat PDF of each submittal. Architect will return one stamped copy via electronic mail.
 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Transmit electronic or fax copy of meeting agenda to Architect no less than two days prior to project meeting. Distribute the agenda to all invited attendees at project meeting.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Progress Meetings: Conduct progress meetings at regular intervals appropriate for stage of construction.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Access.
 - 6) Site utilization.
 - 7) Temporary facilities and controls.
 - 8) Work hours.
 - 9) Hazards and risks.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) RFIs.
 3. Minutes: Contractor is to record the meeting minutes.

4. Reporting: Distribute minutes of the meeting to each party present and to appropriate parties not in attendance.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation via telephone or at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 3. Contractor is to make efforts to minimize frivolous RFIs, particularly those that can be resolved through coordination of subcontractor's work.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 10. Contractor's signature.
 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs: CSI Form 13.2A or similar format.
 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
 1. RFI shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
 - a. Requests for coordination information already indicated in the Contract Documents.
 - b. Requests for adjustments in the Contract Time or the Contract Sum.
 - c. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 3 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log to Architect bi-weekly. RFI log to include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

3.1 END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 4. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 6. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 7. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

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

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where submittals indicated below may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Plumbing submittals
 - b. HVAC submittals
 - c. Electrical submittals
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- F. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with Architect's or Architect's consultant action stamp.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with action mark indicating acceptance.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:

- a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - l. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.
 5. Number of Copies: Submit two copies of Product Data, unless otherwise indicated. Architect will return one copy. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 - m. Relationship to adjoining construction clearly indicated.
 - n. Seal and signature of professional engineer if specified.
 - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
 3. Number of Copies: Submit one Adobe Acrobat PDF format via email of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 3. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Provide electronic mail scanned copy of all submittals to architect.
 4. Samples for Verification: Submit units or Samples prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit one sets of Samples. Architect will retain submitted Sample sets.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- F. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
 4. Number of Copies: Submit one copy of subcontractor list, unless otherwise indicated.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.

- L. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. Material Safety Data Sheets (MSDSs): Do not submit to Architect. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ARCHITECT'S / ACTION

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

END OF SECTION 013300

SECTION 014200 - REFERENCES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA BOCA International, Inc.
(See ICC)

IAPMO International Association of Plumbing and Mechanical Officials (909)
472-4100

www.iapmo.org

ICBO International Conference of Building Officials
(See ICC)

ICBO ES ICBO Evaluation Service, Inc.
(See ICC-ES)

ICC International Code Council (888)
422-7233

www.iccsafe.org (703)
931-4533

ICC-ES ICC Evaluation Service, Inc. (800)
423-6587

www.icc-es.org (562)
699-0543

SBCCI Southern Building Code Congress International, Inc.
(See ICC)

UBC Uniform Building Code
(See ICC)

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE Army Corps of Engineers
www.usace.army.mil

CPSC Consumer Product Safety Commission (800) 638-2772
www.cpsc.gov (301) 504-7923

DOC Department of Commerce (202) 482-2000
www.commerce.gov

DOD Department of Defense (215) 697-6257
<http://.dodssp.daps.dla.mil>

DOE Department of Energy (202) 586-9220
www.energy.gov

EPA Environmental Protection Agency (202) 272-0167
www.epa.gov

FAA Federal Aviation Administration (866) 835-5322
www.faa.gov

FCC Federal Communications Commission (888) 225-5322

www.fcc.gov

FDA Food and Drug Administration (888) 463-6332

www.fda.gov

GSA General Services Administration (800) 488-3111

www.gsa.gov

HUD Department of Housing and Urban Development (202) 708-1112

www.hud.gov

LBL Lawrence Berkeley National Laboratory (510) 486-4000

www.lbl.gov

NCHR National Cooperative Highway Research Program
P

(See TRB)

NIST National Institute of Standards and Technology (301) 975-6478

www.nist.gov

OSHA Occupational Safety & Health Administration (800) 321-6742

www.osha.gov

(202) 693-1999

PBS Public Building Service

(See GSA)

PHS Office of Public Health and Science (202) 690-7694

www.osophs.dhhs.gov/ophs

| | | |
|------|--|----------------|
| RUS | Rural Utilities Service (See USDA) | (202) 720-9540 |
| SD | State Department www.state.gov | (202) 647-4000 |
| TRB | Transportation Research Board http://gulliver.trb.org | (202) 334-2934 |
| USDA | Department of Agriculture www.usda.gov | (202) 720-2791 |
| USPS | Postal Service www.usps.com | (202) 268-2000 |

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

| | | |
|-------|--|-------------------|
| ADAAG | Americans with Disabilities Act (ADA) | (800) 872-2253 |
| | Architectural Barriers Act (ABA) | (202) 272-0080 |
| | Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov | |
| CFR | Code of Federal Regulations | (866) 512-1800 |
| | Available from Government Printing Office www.gpoaccess.gov/cfr/index.html | (202) 512-1800 |

DOD Department of Defense Military Specifications and Standards (215)
697-2664
Available from Department of Defense Single Stock Point
<http://dodssp.daps.dla.mil>

DSCC Defense Supply Center Columbus
(See FS)

FED-STD Federal Standard
(See FS)

FS Federal Specification (215)
697-2664
Available from Department of Defense Single Stock Point
<http://dodssp.daps.dla.mil>

Available from Defense Standardization Program
www.dps.dla.mil

Available from General Services Administration (202)
619-8925
www.gsa.gov

Available from National Institute of Building Sciences (202)
289-7800
www.wbdg.org/ccb

FTMS Federal Test Method Standard
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards (215)
697-2664

Available from Department of Defense Single Stock Point
<http://dodssp.daps.dla.mil>

UFAS Uniform Federal Accessibility Standards (800)
872-2253

Available from Access Board (202)
272-0080

www.access-board.gov

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBH State of California, Department of Consumer Affairs Bureau of Home (800)
F Furnishings and Thermal Insulation 952-5210

www.dca.ca.gov/bhfti (916)
574-2041

CCR California Code of Regulations (916)
323-6815

www.calregs.com

CPU California Public Utilities Commission (415)
C 703-2782

www.cpuc.ca.gov

TFS Texas Forest Service (979)
458-6650

Forest Resource Development

<http://txforests-service.tamu.edu>

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 017300 - EXECUTION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

- B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 1. Before construction, verify the location and points of connection of utility services.

- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of utilities and other construction affecting the Work.
1. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 (Not used)

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance as high as reasonably possible but not less than 8 feet (2.4 m) in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 4. Prepare and submit Project Record Documents, operation and maintenance manuals and similar final record information.
 - 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 7. Complete startup testing of systems.
 - 8. Submit test/adjust/balance records.

9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

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

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order as indicated on drawings.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

- a. Project name.
- b. Date.
- c. Name of Architect.
- d. Name of Contractor.
- e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. Clean exposed hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - e. Remove debris and surface dust from limited access spaces, including plenums, attics, and similar spaces.
 - f. Sweep concrete floors broom clean in unoccupied spaces.
 - g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - i. Remove labels that are not permanent.
 - j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and other foreign substances.
 - l. Replace parts subject to unusual operating conditions.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - q. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes systems and equipment.

- B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Final Submittal: Submit to Owner, one copy of each manual in final form at least 7 days before final inspection.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.

7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.

9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product,

list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. **Manufacturers' Maintenance Documentation:** Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard printed maintenance instructions and bulletins.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training videotape, if available.
- E. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. **Scheduled Maintenance and Service:** Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. **Maintenance and Service Record:** Include manufacturers' forms for recording maintenance.
- F. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. **Maintenance Service Contracts:** Where applicable, include copies of maintenance agreements with name and telephone number of service agent.
- H. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. **Operation and Maintenance Documentation Directory:** Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. **Emergency Manual:** Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 01 Section "Multiple Contract Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
 - 2. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 4. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS**2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."

- d. Name of Architect[and Construction Manager].
- e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Change Orders and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

PART 3 - EXECUTIONRECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
 - 2. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit one complete training manual(s) for Owner's use.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Fire-protection systems, including fire alarm, fire pumps and fire-extinguishing systems.
 - 2. Medical equipment, including medical gas equipment and piping.
 - 3. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
 - 4. HVAC instrumentation and controls.
 - 5. Electrical service and distribution, including transformers, switchboards and panelboards.
 - 6. Packaged engine generators, including transfer switches.
 - 7. Lighting equipment and controls.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:

- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner with at least seven days' advance notice.
- C. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 017900

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood blocking and nailers.
 - 2. Wood shelving and clothes rods.
 - 3. Plywood backing panels.
- B. Related Sections include the following:
 - 1. Division 06 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPAA: Western Wood Products Association.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS**2.1 WOOD PRODUCTS, GENERAL**

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWWA C20 (lumber) and AWWA C27 (plywood).
1. Use treatment that does not promote corrosion of metal fasteners.
 2. Use Exterior type for exterior locations and where indicated.
 3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
 4. Use Interior Type A, unless otherwise indicated.
- B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- D. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
 2. Plywood backing panels.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 15 percent (38-mm actual) thickness.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species.

- C. For exposed boards, provide lumber with 15 percent maximum moisture content and[any of] the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine, No. 1 grade; SPIB.
 3. Hem-fir or hem-fir (north), Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir, Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 SHELVING AND CLOTHES RODS

- A. Shelving: Made from Melamine-faced particleboard with radiused and filled front edge.
- B. Shelf Brackets: Prime-painted formed steel with provision to support clothes rod where rod is indicated.
- C. Clothes Rods: 1-1/4-inch- (32-mm-) diameter, chrome-plated steel tubes.
- D. Rod Flanges: Chrome-plated steel.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 METAL FRAMING ANCHORS

- 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. Cleveland Steel Specialty Co.
 - 2. Harlen Metal Products, Inc.
 - 3. KC Metals Products, Inc.
 - 4. Simpson Strong-Tie Co., Inc.
 - 5. Southeastern Metals Manufacturing Co., Inc.
 - 6. USP Structural Connectors.
- B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations where stainless steel is not indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports, unless otherwise indicated.

- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 WOOD TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.
 - 1. Match color and grain pattern across joints.
 - 2. Install trim after gypsum board joint-finishing operations are completed.
 - 3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads and fill holes.
 - 4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.6-mm) maximum offset for reveal installation.

3.4 PROTECTION

- A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Interior standing and running trim.
2. Plastic-laminate cabinets.
3. Plastic-laminate countertops.
4. Solid-surfacing-material window sills.
5. Closet and utility shelving.
6. Shop finishing of interior woodwork.

- B. Related Sections include the following:

1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
2. Division 09 Section "Stone Facing" for stone countertops.

- C. Subcontractors:

1. In addition to local casework subcontractors of their choice, General Contractors are to request bids from the following casework subcontractors:
 - a. LSI, (763)559-4664 ext.326, Mr. Keith Wroble.
 - b. TMI, (701)456-6716, Mr. Kevin Kovash

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in architectural woodwork.

3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
4. Apply WI-certified compliance label to first page of Shop Drawings.

B. Samples for Verification:

1. Veneer-faced panel products with or for transparent finish, 8 by 10 inches (200 by 250 mm), for each species and cut. Include at least one face-veneer seam and finish as specified.
2. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
3. Solid-surfacing materials, 6 inches (150 mm) square.
4. Exposed cabinet hardware and accessories, one unit for each type and finish.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: As indicated on drawings.
- C. Wood Species for Opaque Finish: As indicated on drawings.
- D. Wood Products: Comply with the following:
 1. Hardboard: AHA A135.4.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
 3. Particleboard: ANSI A208.1, Grade M-2.
 4. Softwood Plywood: DOC PS 1.
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
- E. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.
 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by the manufacturer(s) indicated on drawings.
- G. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 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 following:
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer(s) indicated on drawings
 3. Type: Standard type, unless Special Purpose type is indicated.
 4. Colors and Patterns: As indicated by manufacturer's designations.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal 5 inches (127 mm) long, 2-1/2 inches (63.5 mm) deep, and 5/16 inch (8 mm) in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Shelf Rests: BHMA A156.9, B04013; metal.
- F. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches (150 mm) high and 24 inches (600 mm) wide.
 - 3. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
 - 4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
- G. Door Locks: BHMA A156.11, E07121.
- H. Drawer Locks: BHMA A156.11, E07041.
- I. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

- D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
- E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Custom.
- B. Wood Species and Cut: As indicated on drawings.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Custom.

- B. Wood Species: As indicated on drawings.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

2.7 PLASTIC-LAMINATE CABINETS

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS or HGL.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS or VGS.
 - 4. Edges: Grade HGS or Grade VGS matching laminate in color, pattern, and finish.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS or CLS.
 - 2. Drawer Sides and Backs: Thermoset decorative panels.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated on drawings, selected from laminate manufacturer's full range in the following categories:
 - a. Solid colors.
 - b. Solid colors with core same color as surface.
 - c. Wood grains.
 - d. Patterns.
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.8 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate Grade: HGS or HGP.

- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As indicated by manufacturer's designations.
 2. Match Architect's sample.
 3. As indicated on drawings selected from manufacturer's full range in the following categories:
 - a. Solid colors.
 - b. Solid colors with core same color as surface.
 - c. Wood grains.
 - d. Patterns.
- D. Grain Direction: Parallel to cabinet fronts.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces unless indicated otherwise.
- F. Core Material: Particleboard made with exterior glue.
- G. Core Material at Sinks: Particleboard made with exterior glue or exterior-grade plywood.
- H. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.9 SOLID-SURFACING-MATERIAL WINDOW SILLS

- A. Solid-Surfacing-Material Thickness: As indicated on drawings.
- B. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
1. As selected from manufacturer's full range.
- C. Fabricate sills in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
1. Fabricate sills with shop finished exposed edges with 1/16" radiused corners.

2.10 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch (19-mm) veneer-faced panel product with veneer edge banding.
- C. Cleats: 3/4-inch (19-mm) panel product.

2.11 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section.
- D. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.
- E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
- F. Transparent Finish:
 - 1. Grade: Custom.
 - 2. AWI Finish System: Acrylic lacquer.
 - 3. Staining: Custom color as approved by Architect.
 - 4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
 - 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 - 6. Sheen: As indicated on drawings in conformance with the following measured on 60-degree gloss meter per ASTM D 523.
 - a. Flat, 15-30 gloss units.
 - b. Satin, 31-45 gloss units.
 - c. Semigloss, 46-60 gloss units.
 - d. Gloss, 46-60 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches (1500 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood blocking or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
 - 3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- I. Solid Surface Window Sills: Anchor securely with adhesive to substrate at bottom of window opening.
 - 1. Install sills with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Calk space between sill and wall with clear silicone sealant.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal frames.
- B. Related Sections:
 - 1. Division 08 Section "Door Hardware" for door hardware for doors.
 - 2. Division 09 Sections "Painting" for field painting hollow metal frames.
 - 3. Division 16 Sections for electrical connections including conduit and wiring for door controls and operators.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 2. Locations of reinforcement and preparations for hardware.
 - 3. Details of each different wall opening condition.
 - 4. Details of anchorages, joints, field splices, and connections.
 - 5. Details of accessories.
 - 6. Details of moldings, removable stops, and glazing.
 - 7. Details of conduit and preparations for power, signal, and control systems.
- C. Other Action Submittals:
 - 1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal frame assembly.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at according to NFPA 252 or UL 10B.
- C. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- 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. Amweld Building Products, LLC.
 2. Benchmark; a division of Therma-Tru Corporation.
 3. Ceco Door Products; an Assa Abloy Group company.
 4. Curries Company; an Assa Abloy Group company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Division 08 Section "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as face welded or full profile welded] unless otherwise indicated.
3. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
4. Frames for Borrowed Lights: 0.053-inch- (1.3-mm-) thick steel sheet.

- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

- A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as door face sheet in which they are installed.

- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.6 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jams by butt welding.
3. Provide concealed fasteners only.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.

5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) high.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
 - 5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
- F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide loose stops and moldings on inside of hollow metal work.
 4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.7 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY**A. Section Includes:**

1. Solid-core doors with wood-veneer and plastic-laminate faces.
2. Factory finishing flush wood doors.
3. Factory fitting plastic laminate flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.
3. Frames for light openings, 6 inches (150 mm) long, for each material, type, and finish required.

- D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at according to NFPA 252 or UL 10B.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Algoma Hardwoods, Inc.
2. Ampco, Inc.
3. Buell Door Company Inc.
4. Chappell Door Co.
5. Eagle Plywood & Door Manufacturing, Inc.
6. Eggers Industries.
7. Graham; an Assa Abloy Group company.
8. Haley Brothers, Inc.
9. Ideal Architectural Doors & Plywood.
10. Ipik Door Company.
11. Lambton Doors.
12. Marlite.
13. Marshfield Door Systems, Inc.
14. Mohawk Flush Doors, Inc.; a Masonite company.
15. Poncraft Door Company.
16. Vancouver Door Company.
17. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade: Heavy Duty.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

E. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: Select white birch to be verified w/ Architect prior to ordering.
3. Cut: Plain sliced.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
7. Core: Particleboard.
8. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
9. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.4 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors

1. Grade: Premium.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products.
4. Exposed Vertical Edges: Plastic laminate that matches faces, applied before faces.
5. Core: Particleboard.
6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.
7. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.5 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads .

- B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish and approved for use in doors of fire-protection rating indicated.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises.
- B. Finish doors at factory.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI conversion varnish or catalyzed polyurethane system.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Semigloss].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Plastic Laminate finished doors to be factory-fitted by Aligning in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 08580 - ALUMINUM SLIDING SERVICE WINDOW**PART 1 – GENERAL****1.01 SUMMARY**

- A. This section includes:
 - 1. Aluminum, heavy-duty commercial sliding service windows as indicated in drawings and in sections.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's technical product data substantiating that products comply.
- B. Shop drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.
- C. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver windows crated to provide protection during transit and job storage
- B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.
- C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

- A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

- A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 - PRODUCTS**2.01 ACCEPTABLE MANUFACTURER'S**

- A. Basis of design: Design is based on aluminum (DW) series, deluxe sliding service window manufactured by C.R. Laurence Co., Inc. (800) 421-6144 or approved equal.

2.02 MATERIALS

- A. Head & Jamb Frames: 4" Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Window glides on top-hung heavy-duty ball bearing slides. Poly-pile

- weather stripping and self-latching handle. Overall frame sizes are to be in accordance with the contract drawings.
- B. Finish: All aluminum to be clear anodized.
 - C. Glazing: The glazing is to be laminated clear glass in ¼" to ½" in thickness.
 - D. Options: Provide bottom track recessed flush with top of countertop.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install window in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

- A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds, dirt or other substances.

3.03 PROTECTION

- A. Institute protective measures required throughout the remainder of the construction period to ensure that all the windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION 08580

SECTION 087100 - DOOR HARDWARE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections include the following:
 - 1. Division 08 Section "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
 - 2. Division 16 Sections for connections to electrical power system and for low-voltage wiring work.
 - 3. Division 16 Section "Fire Detection and Alarm" for connections to building fire alarm system.

1.3 SUBMITTALS

- A. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Detail interface between electrified door hardware and fire alarm, access control and security system.
 - 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- B. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- C. Warranty: Special warranty specified in this Section.
- D. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.

- b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - c. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - 10) List of related door devices specified in other Sections for each door and frame.
 - d. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
 - e. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
- 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - 1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices and access control system.
- C. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:

- a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: Three years from date of Substantial Completion, except as follows:
- a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Two years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
 2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).

3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
 4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
1. Entrance Doors: Heavy-weight hinges.
 2. Doors with Closers: Antifriction-bearing hinges.
 3. Interior Doors: Standard-weight hinges.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
1. Interior Hinges: Stainless steel, with stainless-steel pin.
 2. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.
- E. Fasteners: Comply with the following:
1. Wood Screws: For wood doors and frames.
 2. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.

2.3 HINGES

- A. Butts and Hinges: BHMA A156.1 Listed under Category A in BHMA's "Certified Product Directory."
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Available Manufacturers:
1. Baldwin Hardware Corporation (BH).
 2. Bommer Industries, Inc. (BI).
 3. Cal-Royal Products, Inc. (CRP).
 4. Hager Companies (HAG).
 5. Lawrence Brothers, Inc. (LB).
 6. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 7. PBB, Inc. (PBB).
 8. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.4 SPRING HINGES

- A. Self-Closing Hinges: BHMA A156.17. Listed under Category A in BHMA's "Certified Product Directory."
- B. Available Manufacturers:
1. Baldwin Hardware Corporation (BH).
 2. Bommer Industries, Inc. (BI).
 3. Cal-Royal Products, Inc. (CRP).
 4. Hager Companies (HAG).
 5. Lawrence Brothers, Inc. (LB).
 6. McKinney Products Company; an ASSA ABLOY Group company (MCK).

7. PBB, Inc. (PBB).
8. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

- 2.5 ; an ASSA ABLOY Group company (MCK).
1. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 2. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 3. <Insert manufacturer's name.>

2.6 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Electrified Locking Devices: BHMA A156.25.
- D. Lock Trim:
1. Levers: Cast.
 2. Escutcheons (Roses): Cast.
 3. Dummy Trim: Match lever lock trim and escutcheons.
 4. Lockset Designs: Schlage, D Series, "Sparta" or, if sets are provided by another manufacturer, provide designs that match those designated.
- E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- F. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- G. Strikes: Unless indicated otherwise, manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 4. Strikes for Auxiliary Deadlocks: BHMA A156.5.

2.7 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
1. Bored Locks: BHMA A156.2.
 2. Mortise Locks: BHMA A156.13.
 3. Interconnected Locks: BHMA A156.12.
- B. Bored Locks: BHMA A156.2, Grade 1; Series 4000.
1. Available Manufacturers:
 - a. Arrow USA; an ASSA ABLOY Group company (ARW).
 - b. Best Access Systems; Div. of The Stanley Works (BAS).
 - c. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - d. Medeco Security Locks, Inc.; an ASSA ABLOY Group company (MED).
 - e. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - f. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - g. Weiser Lock; a Masco Company (WEI).
 - h. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.8 AUXILIARY LOCKS AND LATCHES

- A. Auxiliary Locks: BHMA A156.5, Grade 1.
1. Available Manufacturers:
 - a. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
 - b. Adams Rite Manufacturing Co. (ARM).
 - c. Arrow USA; an ASSA ABLOY Group company (ARW).
 - d. Best Access Systems; Div. of The Stanley Works (BAS).
 - e. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - f. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - g. Weiser Lock; a Masco Company (WEI).
 - h. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.9 ELECTROMAGNETIC LOCKS

- A. General: BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."
1. Type: Full exterior or full interior, as required by application indicated.
 2. Strength Ranking: 1000 lbf (4448 N).
 3. Inductive Kickback Peak Voltage: Not more than 0 V.
 4. Residual Magnetism: Not more than 4 lbf (18 N) to separate door from magnet.
- B. Delayed-Egress Locks: BHMA A156.24. Listed under Category G in BHMA's "Certified Product Directory."
1. Means of Egress Doors: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds, as required by NFPA 101.
 2. Security Grade: Activated from secure side of door by initiating device.
 3. Movement Grade: Activated by door movement as initiating device.

C. Available Manufacturers:

1. Door Controls International (DCI).
2. Doorguard Systems, Inc. (DGS).
3. Dortronics Systems, Inc. (DS).
4. DynaLock Corp. (DLC).
5. Locknetics; an Ingersoll-Rand Company (LSE).
6. Rutherford Controls Int'l. Corp. (RCI).
7. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
8. Securitron Magnalock Corporation; an ASSA ABLOY Group company (SMC).
9. Security Door Controls (SDC).

2.10 ELECTROMECHANICAL LOCKS

A. General: Grade 1 for type of lock indicated; motor or solenoid driven.

B. Available Manufacturers:

1. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
2. Best Access Systems; Div. of The Stanley Works (BAS).
3. Brink, R. R. Locking Systems, Inc. (RRB).
4. DynaLock Corp. (DLC).
5. Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
6. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
7. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
8. Security Door Controls (SDC).
9. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.11 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1. Listed under Category G in BHMA's "Certified Product Directory."
- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Outside Trim: Lever; material and finish to match locksets, unless otherwise indicated.

1. Match design for locksets and latchsets, unless otherwise indicated.

G. Available Manufacturers:

1. Adams Rite Manufacturing Co. (ARM).
2. Arrow USA; an ASSA ABLOY Group company (ARW).
3. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
4. Door Controls International (DCI).
5. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
6. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
7. Locknetics; an Ingersoll-Rand Company (LSE).
8. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
9. Von Duprin; an Ingersoll-Rand Company (VD).
10. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.12 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Five.
2. Bored-Lock Type: Cylinders with tailpieces to suit locks.

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Construction Keying: Comply with the following:

1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Replace construction cores with permanent cores as directed by Owner.

E. Manufacturer: Same manufacturer as for locks and latches.

F. Available Manufacturers:

1. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
2. Arrow USA; an ASSA ABLOY Group company (ARW).
3. ASSA, Inc.; an ASSA ABLOY Group company (ASA).
4. Best Access Systems; Div. of The Stanley Works (BAS).
5. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
6. Medeco Security Locks, Inc.; an ASSA ABLOY Group company (MED).
7. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
8. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
9. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.13 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Grand Master Key System: Cylinders are operated by a change key, a master key, and a grand master key.
- B. Keys: Nickel silver.
 - 1. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.

2.14 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Portable Cabinet: Tray for mounting in file cabinet, equipped with key-holding panels, envelopes, and cross-index system.

2.15 ELECTRIC STRIKES

- A. Standard: BHMA A156.31, Grade 1.
- B. General: Use fail-secure electric strikes with fire-rated devices.
- C. Available Manufacturers:
 - 1. Adams Rite Manufacturing Co. (ARM).
 - 2. Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
 - 3. Locknetics; an Ingersoll-Rand Company (LSE).
 - 4. Precision Hardware, Inc. (PH).
 - 5. Security Door Controls (SDC).
 - 6. Von Duprin; an Ingersoll-Rand Company (VD).

2.16 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from stainless steel, unless otherwise indicated.
- C. Available Manufacturers:

1. Forms + Surfaces (FS).
2. Hager Companies (HAG).
3. Hiawatha, Inc. (HIA).
4. IVES Hardware; an Ingersoll-Rand Company (IVS).
5. Rockwood Manufacturing Company (RM).
6. Trimco (TBM).

2.17 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
- C. Power-Assist Closers: As specified in Division 08 Section "Automatic Door Operators" for access doors for people with disabilities or where listed in the door hardware sets.
- D. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- E. Surface Closers: BHMA A156.4, Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
1. Available Manufacturers:
 - a. Arrow USA; an ASSA ABLOY Group company (ARW).
 - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - c. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - d. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
 - e. LCN Closers; an Ingersoll-Rand Company (LCN).
 - f. Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - g. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - h. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - i. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.18 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

B. Available Manufacturers:

1. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
2. Hager Companies (HAG).
3. Hiawatha, Inc. (HIA).
4. IVES Hardware; an Ingersoll-Rand Company (IVS).
5. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
6. Rockwood Manufacturing Company (RM).
7. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
8. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.19 DOOR GASKETING

A. Standard: BHMA A156.22.

B. General: Provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners.

1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.

1. Provide smoke-labeled gasketing on fire 20-minute-rated doors and on smoke-labeled doors.

D. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

E. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

G. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

H. Available Manufacturers:

1. Hager Companies (HAG).
2. M-D Building Products, Inc. (MD).
3. National Guard Products (NGP).
4. Pemko Manufacturing Co. (PEM).

2.20 MISCELLANEOUS DOOR HARDWARE

A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.

- B. Auxiliary Hardware: BHMA A156.16, Grade 1.
 - 1. Available Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Hager Companies (HAG).
 - c. Rockwood Manufacturing Company (RM).
 - d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.21 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Strike plates to frames.
 - 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Closers to doors and frames.
 - b. Surface-mounted exit devices.
 - 4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.22 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

- D. **Boxed Power Supplies:** Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. **Configuration:** Provide one power supply for each door opening.

3.4 ADJUSTING

- A. **Initial Adjustment:** Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. **Electric Strikes:** Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 2. **Door Closers:** Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. **Occupancy Adjustment:** Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

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

3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 087100

SECTION 092600 - GYPSUM BOARD ASSEMBLIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.
 - 2. Tile backing panels.
 - 3. Non-load-bearing steel framing.
- B. Related Sections include the following:
 - 1. Division 6 Section "Miscellaneous Rough Carpentry" for wood blocking for support of other construction and accessories.

1.3 DEFINITIONS

- A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory." or other authorities as indicated on drawings.
- B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

- 1. Steel Framing and Furring:

- a. Clark Steel Framing Systems.
- b. Consolidated Systems, Inc.
- c. Dale Industries, Inc. - Dale/Incor.
- d. Dietrich Industries, Inc.
- e. MarinoWare; Division of Ware Ind.
- f. National Gypsum Company.
- g. Scafco Corporation..

- 2. Gypsum Board and Related Products:

- a. American Gypsum Co.
- b. G-P Gypsum Corp.
- c. National Gypsum Company.
- d. United States Gypsum Co.

2.2 STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- C. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
 - b. Chicago Metallic Corporation; Drywall Furring 640 System.
 - c. USG Interiors, Inc.; Drywall Suspension System.

2.3 STEEL PARTITION AND SOFFIT FRAMING

- A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.
 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
1. Minimum Base Metal Thickness: 0.027 inch (0.7 mm).
- C. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
1. Product: Subject to compliance with requirements, provide one of the following:
 - a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
 - b. Metal-Lite, Inc.; Slotted Track.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
- E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
1. Depth: 1-1/2 inches (38.1 mm).
 2. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
 2. Depth: 7/8 inch (22.2 mm).
- G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical, with face attached to single flange by a slotted leg (web).
- H. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange.
1. Depth: 3/4 inch (19.1 mm).
 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.
- I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.
- J. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.4 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
 - 1. Regular Type:
 - a. Thickness: 5/8 inch (15.9 mm), unless otherwise indicated.
 - b. Long Edges: Tapered.
 - c. Location: As indicated.
 - 2. Type X:
 - a. Thickness: 5/8 inch (15.9 mm).
 - b. Long Edges: Tapered.
 - c. Location: As indicated or where required for fire-resistance-rated assembly.
- C. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board.
 - 1. Thickness: 1/2 inch (12.7 mm).
 - 2. Long Edges: Tapered.
 - 3. Location: Ceiling surfaces.
- D. Proprietary, Special Fire-Resistive Type: ASTM C 36, having improved fire resistance over standard Type X.
 - 1. Products: Subject to compliance with requirements, provide [one of] the following:
 - a. American Gypsum Co.; FireBloc Type C.
 - b. G-P Gypsum Corp.; Firestop Type C.
 - c. National Gypsum Company; Gold Bond Fire-Shield G.
 - d. United States Gypsum Co.; SHEETROCK Brand Gypsum Panels, FIRECODE C Core.
 - 2. Thickness: 5/8 inch (15.9 mm).
 - 3. Long Edges: Tapered.
 - 4. Location: As indicated or where required for specific fire-resistance-rated assembly indicated.

2.5 TILE BACKING PANELS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M.
 - 1. Core: As indicated on Drawings, minimum 1/2 inch (12.7 mm), regular type or 5/8 inch (15.9 mm), Type X at fire rated assemblies.

2.6 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes: As required for conditions of project indicated and not indicated.
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.7 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 ACOUSTICAL SEALANT

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.

- b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.9 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- 1. Thickness: As indicated on drawings or minimum 3-1/2" if not indicated.
 - 2. Fire-Resistance-Rated Assemblies: Comply with requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure

have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1. Verify methods of suspension system attachment to structure above with roof truss framing manufacturer.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Use deflection track where partitions extend to underside of roof structure.
 - b. Use firestopping methods and materials in compliance with UL test assemblies or other testing agencies acceptable to authorities having jurisdiction for deflection track installation where fire rated partitions extend to underside of roof structure.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
 4. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member and transversely between parallel members.

- C. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at or above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief. Fasten studs to top track by methods to allow independent movement of studs and track.
 - 2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring at the following spacings:
 - 1. Single-Layer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
 - 2. Multilayer Construction: 16 inches (406 mm) o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install two studs at each jamb, unless otherwise indicated.
 - 2. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- G. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members using resilient channels, or provide control joints to counteract wood shrinkage.
- I. Form control and expansion joints with space between edges of adjoining gypsum panels.
- J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of roof truss framing, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- L. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.
- N. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 PANEL APPLICATION METHODS

- A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
- B. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- D. Multilayer Fastening Methods: In fire-rated and STC-rated partitions fasten base and face layers as indicated in test assembly requirements. In other partitions, fasten base layers and face layers separately to supports with screws.
- E. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- F. Tile Backing Panels:
 1. Water-Resistant Gypsum Backing Board: Install at locations indicated to receive wall tile finish. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
 2. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - 4. Level 5: At surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting.

3.10 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09260

SECTION 092900 - GYPSUM BOARD**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood blocking for casework and accessory support to be installed in gypsum board finished partitions.
 - 2. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
 - 3. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. National Gypsum Company.
 - d. USG Corporation.
- B. Regular Type:
 1. Thickness: 5/8 inch (15.9 mm) unless indicated otherwise on drawings.
 2. Long Edges: Tapered.
- C. Type X:
 1. Thickness: 5/8 inch (15.9 mm).
 2. Long Edges: Tapered.
- D. Type C:
 1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 2. Long Edges: Tapered.
- E. Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 1. Thickness: 1/4 inch (6.4 mm).
 2. Long Edges: Tapered.
- F. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 1. Thickness: 1/2 inch (12.7 mm).
 2. Long Edges: Tapered.

2.3 TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. National Gypsum Company.
 - d. USG Corporation.
 2. Core: As indicated on Drawings, minimum 1/2 inch (12.7 mm), regular type or 5/8 inch (15.9 mm), Type X at fire rated assemblies.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 2. Shapes: As required for conditions of project indicated and not indicated.
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Thickness: As indicated on drawings or minimum 3-1/2" if not indicated.
2. Fire-Resistance-Rated Assemblies: Comply with requirements of assembly.

E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR or AIS-919.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Regular Type: As indicated on Drawings.
 - 2. Type X: Where required for fire-resistance-rated assembly.
 - 3. Type C: Where required for specific fire-resistance-rated assembly indicated.
 - 4. Ceiling Type: Ceiling and soffit.

5. Moisture-Resistant Type: At all partition locations to receive wall tile finish.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

- A. Water-Resistant Gypsum Backing Board: Install at partitions indicated to receive wall tile finish. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for tile.
 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 4. Level 5: At surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096510 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Vinyl composition tile.
- 2. Static Dissipative Tile
- 3. Resilient wall base

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
 - 1. Certification by tile manufacturer that products supplied for tile installation comply with local regulations controlling use of volatile organic compounds (VOC's).
- C. Samples for verification purposes in full-size tiles of each different color and pattern of resilient floor tile specified, showing full range of variations expected in these characteristics.
 - 1. Resilient wall base: Manufacturer's standard size samples, but not less than 12 inches (300mm) long, of each resilient color and pattern required.
- D. Product certificates, in lieu of laboratory test reports when permitted by Architect, signed by manufacturer certifying that each product complies with requirements.
- E. Maintenance data for resilient floor tile, to include in Operating and Maintenance Manual.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Floor Tile: Obtain each type, color, and pattern of tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire Performance Characteristics: Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
3. Smoke Density: Less than 450 per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install tiles until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during tile installation.
- D. Install resilient products after other finishing operations, including painting, have been completed.

1.7 SEQUENCING AND SCHEDULING

- A. Install tiles and accessories after other finishing operations, including painting, have been completed.
- B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 VINYL COMPOSITION TILE

- A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066.
 - 1. Armstrong World Industries, Inc.
 - 2. Mannington Commercial
- B. Class: (2(through-pattern tile)).
- C. Wearing surface: Smooth
- D. Thickness 0.125 inch (3.2mm)
- E. Size: 12 by 12 inches (305 by 305 mm)
- F. Fire-Test-Response Characteristics:
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm. per ASTM E 648.

2.3 RESILIENT WALL BASE

- A. Wall base: ASTM F 1861
- B. Composition: Rubber
- C. Height: 4"
- D. Size: 120 Foot rolled goods
- E. Accessories: Pre-molded inside and outside corners

2.4 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- C. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. For wood subfloors verify the following:
 - 1. Underlayment over subfloor complies with requirements specified in Division 6 "Rough Carpentry."
 - 2. Underlayment surface is free of surface irregularities and substances with potential to interfere with adhesive bond, show through surface, or stain tile.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.
- B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 TILE INSTALLATION

- A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain running in one direction.
 - 2. Lay tiles in basket weave pattern with grain direction alternating between reversed in adjacent tiles.
 - 3. Lay tiles in pattern with respect to location of colors, patterns, and sizes as indicated on Drawings.
- D. Where demountable partitions and other items are indicated for installing on top of finished tile floor, install tile before these items are installed.
- E. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- F. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- H. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- I. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- J. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- K. Hand roll tiles where required by tile manufacturer.

3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

- D. Do not stretch wall base during installation.
- E. Use pre-formed inside and outside corners.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing tile installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
 - 4. Damp-mop tile to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.
 - 1. Apply protective floor polish to tile surfaces that are free from soil, visible adhesive, and surface blemishes.
 - a. Use commercially available, metal, cross-linked acrylic product acceptable to tile manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 - 2. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.
 - 3. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.
 - 1. Strip protective floor polish that was applied after completing installation prior to cleaning.
 - 2. Reapply floor polish after cleaning.

END OF SECTION 096510

SECTION 096660 - SHEET VINYL FLOOR COVERINGS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Sheet vinyl floor coverings, adhesive and heat welded seams installation.
 - 2. Sheet vinyl floor coverings, adhesive and flash covered base installation

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
 - 1. Certification by floor covering manufacturer that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).
- C. Shop drawings showing location of seams and edge strips. Indicate location of columns, doorways, enclosing partitions, built-in cabinets, and locations where cutouts are required in flooring.
- D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual sections of sheet vinyl floor coverings showing full range of colors and patterns available for each different product indicated.
- E. Samples for verification purposes in form of 6-inch by 9-inch sections of each different color and pattern of sheet vinyl floor covering product specified, showing full range of variations expected in these characteristics.
- F. Product certificates, in lieu of laboratory test reports when permitted by Architect, signed by manufacturer certifying that each product complies with requirements.
- G. Installer certificates signed by floor covering manufacturer certifying that Installers comply with requirements specified under "Quality Assurance" article.
- H. Maintenance data for sheet vinyl floor coverings, to include in the Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage Installer that is certified by floor covering manufacturer as competent in the technique for heat-welding seams.
- B. Single-Source Responsibility for Sheet Vinyl Floor Coverings: Obtain each type, color, and pattern of sheet vinyl floor covering from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Fire Performance Characteristics: Provide sheet vinyl floor coverings with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by Underwriters Laboratories, Inc. (UL) or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq. cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet vinyl floor coverings and installation accessories to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- C. Move sheet vinyl floor coverings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F (21 deg C) in spaces to receive sheet vinyl floor coverings for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install sheet vinyl floor coverings until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic while installing sheet vinyl floor covering.

1.7 SEQUENCING AND SCHEDULING

- A. Install sheet vinyl floor coverings and accessories after other finishing operations, including painting, have been completed.
- B. Do not install sheet vinyl floor coverings over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by floor covering manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements provide one of the following:
 - 1. Armstrong Possibilities
 - 2. Mannington Fine Fields
- B. Unbacked Sheet Vinyl Floor Covering: ASTM F 1913 (0.080 inch (2.0 mm)thick).
- C. Color and Pattern: As selected by Interior Designer from manufacturer's full range.
- D. Wearing Surface: Smooth.
- E. Sheet Width: As standard with manufacturer
- F. Seaming Method: Heat Welded.
- G. Fire Test Response Characteristics:
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E648.

2.2 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by floor covering manufacturer for applications indicated.
- C. Adhesives (Cements): Water-resistant, stabilized type as recommended by manufacturer to suit sheet vinyl floor covering products and substrate conditions indicated.
- D. Seam Sealer: Formulation provided or approved by floor covering manufacturer for products indicated.
- E. Rod for Heat-Welding Seams: Product of floor covering manufacturer in color complying with the following requirement.
 - 1. Match field color of sheet vinyl floor covering.
 - 2. As selected by Architect to contrast with field color of sheet vinyl floor covering.

- F. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of sheet vinyl floor coverings, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of sheet vinyl floor coverings will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with floor covering manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by floor covering manufacturer.
 - 2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. For wood subfloors verify the following:
 - 1. Underlayment over subfloor complies with requirements specified in Division 6 "Rough Carpentry."
 - 2. Underlayment surface is free of surface irregularities and substances with potential to interfere with adhesive bond, show through surface, or stain sheet vinyl floor coverings.
- D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive sheet vinyl floor coverings.
- B. Use trowelable leveling and patching compounds per floor covering manufacturer's direction to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture, alkaline salts, carbonation, or dust.
- E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

- A. General: Comply with sheet vinyl floor covering manufacturer's installation instructions and other requirements indicated that are applicable to each type of floor covering installation included in Project.
- B. Lay out sheet vinyl floor coverings to comply with the following requirements:
 - 1. Maintain uniformity of sheet vinyl floor covering direction.
 - 2. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of resilient floor coverings for color shading and pattern at seams.
 - 4. Avoid cross seams.
- C. Where demountable partitions and other items are indicated for installing on top of finished floor covering, install floor covering before these items are installed.
- D. Scribe, cut, and fit sheet vinyl floor coverings to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture, including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- E. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- G. Install sheet vinyl floor coverings on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- H. Adhere sheet vinyl floor coverings to flooring substrates by method approved by floor covering manufacturer.
 - 1. Produce completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.
 - 2. Comply with floor covering manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- I. Heat-weld seams in sheet vinyl floor coverings where this seaming method is indicated. Prepare, weld, and finish seams to produce a surface flush with adjoining sheets.
- J. Integral Flash Cove Base: Where indicated, cove sheet vinyl floor coverings up vertical surfaces 6" to form integral base of height indicated over cove support strip with top edge butted against and covered by cap molding.
- K. Hand roll sheet vinyl floor coverings in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press floor coverings firmly in place with flat-bladed instrument.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing sheet vinyl floor coverings:
1. Remove visible adhesive and other surface blemishes using cleaner recommended by floor covering manufacturers.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor until after period recommended by floor covering manufacturer.
 4. Damp-mop floor to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by floor covering manufacturer.
1. Apply protective floor polish to sheet vinyl floor covering surfaces that are free from soil, visible adhesive, and surface blemishes.
 - a. Use commercially available, metal, cross-linked acrylic product acceptable to floor covering manufacturer.
 - b. Coordinate selection of floor polish with Owner's maintenance service.
 2. Cover sheet vinyl floor coverings with undyed, untreated building paper until inspection for Substantial Completion.
 3. Do not move heavy and sharp objects directly over sheet vinyl floor coverings. Place plywood or hardboard panels over floor coverings and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean resilient sheet flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean sheet vinyl floor coverings by method recommended by manufacturer.
1. Strip protective floor polish that was applied after completing installation, prior to cleaning.
 2. Reapply floor polish after cleaning.

END OF SECTION 096660

SECTION 099000 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- B. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
- C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
 - 1. Prefinished items not to be painted include the following factory-finished components:
 - a. Metal toilet enclosures.
 - b. Acoustic materials.
 - c. Architectural woodwork and casework.
 - d. Elevator entrance doors and frames.
 - e. Elevator equipment.
 - f. Finished mechanical and electrical equipment.
 - g. Light fixtures.
 - h. Switchgear.
 - i. Distribution cabinets.
 - 2. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each paint system specified, including block fillers and primers.

1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- C. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
 2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
 2. Product description (generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume, for pigment and vehicle constituents.
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. The Glidden Company
 - 2. Benjamin Moore and Co.
 - 3. Pratt and Lambert
 - 4. The Sherwin-Williams Company

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors and Sheens: As indicated on drawings.

2.3 INTERIOR PRIMERS

- A. Primers: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal Substrates: Quick Drying, rust inhibitive metal primer.
 - 2. Zinc -Coated Metal Substrates: Galvanized metal primer.
 - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
 - 2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize

with ammonia, rinse, allow to dry, and vacuum before painting.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
 - c. When transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
 4. Ferrous Metals: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
 - a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Carefully mix and prepare paint materials according to manufacturer's directions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
 3. Use only thinners approved by the paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Provide finish coats that are compatible with primers used.
 3. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
 4. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
 5. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
 8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
 10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
 11. Sand lightly between each succeeding enamel or varnish coat.
 12. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
- C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- E. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- F. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items

exposed in mechanical equipment rooms and in occupied spaces.

- G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- H. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.
- J. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 - 2. The testing agency will perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative materials analysis.
 - b. Abrasion resistance.
 - c. Apparent reflectivity.
 - d. Flexibility.
 - e. Washability.
 - f. Absorption.
 - g. Accelerated weathering.
 - h. Dry opacity.
 - i. Accelerated yellowness.
 - j. Recoating.
 - k. Skinning.
 - l. Color retention.
 - m. Alkali and mildew resistance.
 - 3. If test results show material being used does not comply with specified requirements, the

Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
 - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINT SCHEDULE

- A. General: Provide the following paint systems for the various substrates, as indicated.
 - 1. One coat of prime and two coats of finish as specified on drawings.
 - 2. Epoxy paint, water borne polyamid, semi-gloss in rooms specified on drawings.
 - 3. For interior metal door frames, interior window frames: One coat of primer and two coats of semi-gloss, alkyd.

END OF SECTION 099000

SECTION 102600 - WALL AND DOOR PROTECTION**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Wall guards.
- 2. Corner guards.

1.3 SUBMITTALS

- A. Shop Drawings: For each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 - 1. Wall and Corner Guards: 12 inches (300 mm) long. Include examples of joinery, corners, end caps, top caps, and field splices.
- C. Maintenance Data: For each impact-resistant wall-protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- B. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall-protection units and are based on the specific system 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.

- D. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
 2. Keep plastic sheet material out of direct sunlight.
 3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).
 - a. Store corner-guard covers in a vertical position.
 - b. Store wall-guard covers in a horizontal position.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.
- B. Field Measurements: Verify actual locations of walls, columns, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall-protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

1.8 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. Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 8-foot- (2.4-m-) long units.
 2. Corner-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot- (1.2-m-) long units.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Extruded Rigid Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; thickness as indicated.
1. Impact Resistance: Minimum 25.4 ft-lbf/in. (1356 J/m) of notch when tested according to ASTM D 256, Test Method A.
 2. Chemical and Stain Resistance: Tested according to ASTM D 543.
 3. Self-extinguishing when tested according to ASTM D 635.
 4. Flame-Spread Index: 25 or less.
 5. Smoke-Developed Index: 450 or less.
- B. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated but with not less than strength and durability properties specified in ASTM B 221 (ASTM B 221M) for Alloy 6063-T5.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M.
- D. Brass: ASTM B 249/B 249M for extruded shapes and ASTM B 36/B 36 M for sheet.
- E. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- F. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.
1. Use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Gypsum Board and Panel Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Contact Adhesive: 80 g/L.

2.2 WALL GUARDS

- A. Crash Rail Wall Protection: Heavy-duty assembly consisting of continuous rubber or vinyl bumper cushion(s) centered in the retainer; designed to withstand impacts.
1. Basis-of-Design Product: Construction Specialties, Acrovyn #SCR-40 or a comparable product by one of the following:
 2. Available Manufacturers:

- a. ARDEN Architectural Specialties, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. Korogard Wall Protection Systems; Division of RJF International Corporation.
 - e. Pawling Corporation.
3. Cover: Extruded rigid plastic, minimum 0.100-inch (2.5-mm) wall thickness; as follows:
 - a. Profile: Flat profile, nominal 4 inches high by +/-1 inch (100 mm high by +/-25 mm) deep.
 - b. Color and Texture: As indicated on interior design finish drawings selected from manufacturer's full line.
 4. Retainer: Minimum 0.080-inch- (2.0-mm-) thick, 1-piece, extruded aluminum.
 - a. Mounting: Surface mounted directly to wall.
 5. End Caps and Corners: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
 6. Accessories: Concealed splices and mounting hardware.

2.3 CORNER GUARDS

- A. Surface-Mounted, Resilient, Plastic Corner Guards consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 1. Basis-of-Design Product: Construction Specialties #SM-20 or a comparable product by one of the following:
 2. Available Manufacturers:
 - a. ARDEN Architectural Specialties, Inc.
 - b. Balco, Inc.
 - c. Construction Specialties, Inc.
 - d. Korogard Wall Protection Systems; Division of RJF International Corporation.
 - e. Pawling Corporation.
 3. Cover: Extruded rigid plastic, minimum 0.100-inch (2.5-mm) wall thickness;
 - a. Profile: Nominal 3-inch- (75-mm-) long leg and 1/4-inch (6-mm) corner radius.
 - b. Height: 4 feet (1.2 m).
 - c. Color and Texture: As indicated on interior design finish drawings selected from manufacturer's full line.
 4. Retainer: Minimum 0.060-inch- (1.5-mm-) thick, 1-piece, extruded aluminum.
 5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.

2.4 FABRICATION

- A. Fabricate impact-resistant wall-protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
 - 1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 2. For impact-resistant wall-protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall-protection units in locations and at mounting heights as directed by Owner.
2. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet (6.1 m), splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches (305 mm).
 - c. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove any excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 105200 - FIRE-PROTECTION SPECIALTIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.
 - 3. Mounting brackets for fire extinguishers.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: For fire-protection cabinets with factory-applied finishes.
- C. Samples for Verification: For each type of exposed factory-applied finish required for fire-protection cabinets, prepared on Samples of size indicated below.
 - 1. Size: 6 by 6 inches square.
- D. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 1. Sheet: ASTM B 209.
 2. Extruded Shapes: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.

2.2 PORTABLE FIRE EXTINGUISHERS

- A. Manufacturers:
 1. Badger Fire Protection.
 2. JL Industries, Inc.
 3. Larsen's Manufacturing Company.
 4. Other Manufacturers as approved by Architect.
- B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
 1. Valves: Manufacturer's standard.
 2. Handles and Levers: Manufacturer's standard.

3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 FIRE-PROTECTION CABINETS

- A. Basis-of-Design Product: Occult Series, SS-0-2409-Solid-Black Type A Die Cut Lettering, by Larsen's Manufacturing Co., or a comparable product by one of the following:
- B. Available Manufacturers:
 1. General Accessory Mfg. Co.
 2. JL Industries, Inc.
 3. Larsen's Manufacturing Company.
- C. Cabinet Type: Suitable for fire extinguisher.
- D. Cabinet Construction: Nonrated.
- E. Cabinet Material: Stainless-steel sheet.
 1. Shelf: Same metal and finish as cabinet.
- F. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
 1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
- G. Door Material: Stainless-steel sheet.
- H. Door Style: Flush opaque panel, frameless, with no exposed hinges.
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 1. Provide projecting door pull and friction latch.
 2. Provide concealed hinge permitting door to open 180 degrees.
- J. Accessories:
 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Black.

4) Orientation: Vertical wording with horizontally oriented individual letters.

K. Finishes:

1. Stainless Steel: No. 4 finish.

2.4 MOUNTING BRACKETS

A. Available Manufacturers:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Other Manufacturers as approved by Architect.

B. Mounting Brackets: Manufacturer's galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

1. Color: Red/Black.

C. Identification: Signage complying with authorities having jurisdiction for letter style, size, spacing, mounting methods and location. Locate to identify location of extinguisher in compliance with requirements of authority having jurisdiction.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER."

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
 - a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Miter and weld perimeter door frames.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable

if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 STAINLESS-STEEL FINISHES

- A. General: Remove tool and die marks and stretch lines or blend into finish.
 - 1. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- B. Bright, Directional Polish: No. 4 finish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights indicated below and acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
 - 2. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, notify Architect.
 - 2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

- D. Identification: Apply signage over each fire extinguisher not installed in a cabinet.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices if provided, operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10520

SECTION 108010 - TOILET AND BATH ACCESSORIES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Toilet and bath accessories.
 - 2. Under-lavatory guards.
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet Compartments" for compartments and screens if provided.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.
- C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule as indicated in the Drawings.
 - 1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide accessories from the following manufacturer's only:
1. Toilet and Bath Accessories:
 - a. Bobrick Washroom Equipment, Inc.
 2. Under lavatory Guards:
 - a. Brocar Products, Inc.
 - b. Truebro, Inc.
 - c. Other manufacturer's as approved by Architect.

2.2 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- C. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

- A. General: One, maximum 1-inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
- C. Recessed and Surface Mounted Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

- E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
 - 1. One-piece galvanized steel, wall-hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - 2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
- C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.
- D. Coordinate and install accessories required to be accessible to the handicapped with ADA requirements. ADA compliant dimensions indicated on drawings take precedent to manufacturer's recommendations.
- E. Install under lavatory guards at all exposed piping beneath lavatories.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10801

SECTION 122200 - CURTAIN TRACKS**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes drapery tracks.

1.3 SUBMITTALS

- A. Product Data: For the following:

- 1. Tracks: Include maximum weights of draperies that can be supported.

- B. Shop Drawings:

- 1. Tracks: Show installation and anchorage details and locations of controls.

- C. Coordination Drawings: For track installation; reflected ceiling plans drawn to scale and coordinating track installation with openings and ceiling-mounted items. Show the following:

- 1. Suspended ceiling components.

- D. Samples for Initial Selection: For each type of product indicated.

- E. Samples for Verification: As follows:

- 1. Tracks: 18 inches (450 mm) long, with carriers, controls, and accessories.

- F. Maintenance Data: For products to include in maintenance manuals.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before drapery track fabrication and indicate measurements on Shop Drawings.

1.5 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. Track Carriers: For each size indicated, equal to 5 percent of amount installed, but no fewer than 10 of each size.

PART 2 - PRODUCTS

2.1 CURTAIN TRACKS

A. Surface Mounted Curtain Track:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Kirsch.
 - b. Silent Gliss USA Inc..
 - c. Springs Industries, Inc..
2. Construction: Extruded aluminum, prepared for mounting at interval of not more than 24 inches (610 mm) o.c..
 - a. Lengths and Configurations: As indicated on Drawings.
 - b. Size: Approximately 1-1/2 inch wide by 3/4 inches high.
 - c. Curved Track: Factory fabricated 12-inch radius bends.
 - d. Support Capability: As required to support curtains selected by Owner but not less than 80 lb (36 kg) mounted on track length indicated.
 - e. Finish: Clear anodic coating.
3. Mounting Brackets: Aluminum, of type suitable for fastening track to surface indicated and designed to support weight of track assembly and drapery plus force applied to operate track.
 - a. Mounting Surface: Ceiling.
4. Installation Fasteners: Sized to support track assembly and drapery, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.
5. Carriers: Two nylon rollers with nylon axle and tangle free nylon swivel stem with chrome-plated steel hooks.

PART 3 - EXECUTION

3.1 DRAPERY TRACK INSTALLATION

- A. Install track systems according to manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.

3.2 ADJUSTING

- A. After hanging of draperies, test and adjust each track to produce unencumbered, smooth operation.

END OF SECTION 122200

SECTION 15010 - MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. A requirement occurring in one is as binding as though occurring in all. They are intended to be complimentary and to describe and provide for a complete work. Work specified but not indicated or indicated but not specified, shall be provided as though mentioned in both Specifications and Drawings. Contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.
- B. Mechanical, Architectural, Structural, Electrical and all other Drawings as well as the Specifications for all the Divisions are a part of the Contract Documents.

1.2 WORK INCLUDES

- A. Mechanical General Provisions includes Basic Materials and Methods, Insulation, Plumbing, Fire Protection, Heat Transfer, Air Distribution and Temperature Control collectively, individually or in any combination of the several headings and the coordination and administration thereof.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Temporary Water Service, Sanitary Facilities, Fire Protection and Heating for Construction: Division 1 General Requirements
- C. Door Grilles and Undercuts: Division 8
- D. Finish Painting: Division 9
- E. Electric Power Wiring: Electrical Division 16

1.4 QUALITY ASSURANCE

- A. Codes, Permits and Fees
 - 1. Comply with rules, regulations of State, County, and City Authorities having jurisdiction over the premises, including safety requirements of OSHA. Do not construe this as relieving Contractor from complying with specifications, which exceed Code requirements.

2. Secure and pay for all permits, tap-in fees, and inspections required. Make payments to all public utilities for work performed by them in providing service connections.
3. Turn over all certificates of approval, by governing agencies, to the Architect.

B. Standards

1. Comply with applicable provisions of the latest adopted edition of the following standards:

| | |
|----------|---|
| U.L. | Underwriters' Laboratories, Inc. |
| N.F.P.A. | National Fire Protection Association |
| ASHRAE | American Society of Heating, Refrigeration and Air Conditioning Engineers |
| SMACNA | Sheet Metal and Air Conditioning Contractors National Association |
| AWS | American Welding Society |
| AWWA | American Water Works Association |
| OSHA | Occupational Safety and Health Administration |
| AGA | American Gas Association |
| NEMA | National Electrical Manufacturer's Association |
| AFI | Air Filter Institute |
| ANSI | American National Standards Institute |
| P.P.I. | Plastic Piping Institute |
| ASTM | American Society for Testing and Materials |
| ASSE | American Society of Sanitary Engineering |
| FS | Federal Specifications |
| NPVC | National Pressure Vessel Code |

- C. The Bidder is required to examine carefully the site of the proposed work, the proposal, drawings, specifications, and contract forms. No additional payment will be made on claims that arise from lack of knowledge of existing conditions. He shall satisfy himself as to the character, quality, and quantities of work to be performed, materials to be provided, and as to the requirements of these specifications, special provisions and contract. The submission of a proposal shall be prima-facie evidence that the Bidder has made such an examination.
- D. The Contractor shall provide all the necessary materials, labor, superintendence, tools, appliances, and equipment, and shall execute in a workmanlike manner the work of this contract within the time and in the manner specified, and in conformity with the requirements set forth herein and in accordance with the contract documents.
- E. It is the intention of the Specifications and Drawings for the mechanical work that each part will be complete as related to other parts and that there will be no omission from any portion of the system or systems, even though each and every minor item may not be specifically mentioned in the Specifications nor indicated on the Drawings. The systems shall be complete with all necessary accessories for proper operation.
- F. Work and material specifically required by State and/or Local regulations, but not included in these Specifications nor indicated on the Drawings, shall be provided by the Contractor.

1.5 GENERAL DEFINITIONS

- A. Wherever the words herein defined are used in this specification or on the drawings, they shall have the meaning here given.
- B. Abstract Wording: Wherever the words "Directed", "Required", "Permitted", "Instructed", or words of like import are used, it shall be understood that the direction, requirement, permission, instruction, designation, etc., of the Architect is intended.
- C. Where the word "Provide" appears, it shall be interpreted to mean the Contractor shall furnish all labor, materials, equipment and supplies necessary to install and place in operating condition.
- D. Equal and Equivalent: shall be understood to mean of the same quantity, size, number, value, degree, intensity and the items are similar in all respects. The final decision of acceptance of these items will be made by the Engineer. It shall be understood that for any specified item on Drawings and in the Specifications, this term shall apply.
- E. Utilities: Includes, but not limited to gas and water mains, sanitary and storm sewers, steam lines, electrical distribution system, telephone distribution system and lawn sprinkler system.

1.6 SUBMITTALS

- A. Shop Drawings
 - 1. Submit shop drawings for review by the Engineer as directed in contract documents for items listed. Refer to General Conditions and Division 1.
 - 2. Prior to submitting shop drawings, Contractor shall check for dimensional correctness, interferences and conformance to drawings and specifications. **Stamp drawings "approved" to indicate when stipulated check has been made.**
 - 3. Cuts or catalogs including descriptive literature and characteristics of equipment shall show dimensions, roughing-in data, capacity, curves, pressure drop, code compliance, motor and drive data and electrical data. Observe special instructions where required.
 - 4. Shop drawings are required for but not limited to the following:

PLUMBING

Floor drains
Cleanouts
Plumbing fixture cuts including trim, fittings and carriers
Storage tanks
Valves

Hot water recirculation pumps
Pipe and equipment insulation
Access panels
Waste piping, fittings and fitting sealant
All water piping, fittings and fitting sealant
Special valves of all types
Expansion loops, expansion joints, guides and anchors
Supports
Vibration isolators
Hangers
Thermometers and pressure gauges
Relief valves
All relative items for temporary sanitary, storm, and water service.
Natural gas piping, valves, fittings and fitting sealant.

FIRE PROTECTION

Hydraulic calculations
Double check valve assembly
Sprinkler heads
Piping, fittings and fitting sealant
Valves
Siamese connection; post indicator valve
Pressure gauges
Piping layout and building sections
Hangers, supports, anchors, and thrust blocks
Drains valves: locations and indicated piping to drains
Standpipes and related piping
Flow switches
Tamper switches
Wiring diagrams
All required data listed in N.F.P.A.
Inspector test valve
All related items for temporary fire services

HVAC

Equipment room layouts including equipment, piping, valves, thermometers, pressure gauges, other accessories, show clearances for operating and service
Valves including test and operating pressures and temperatures
Pipe, duct and equipment insulation
Foundations, supports and hangers
All supply, return and exhaust fans including fan curves
Rooftop units
Ductwork and piping layout
Filters
Temperature control system and components
Unit heaters

Supply, return and exhaust registers
Control and wiring diagrams
Duct material, joining methods, duct sealant, duct hangers and supports
Variable air volume/Variable Temperature boxes
Heating coils
Volume dampers
Access panels

B. Record Drawings (Also see Division I)

1. Each Contractor for Mechanical work shall keep one complete set of the contract working drawings on the job site on which all deviations or changes from such contract drawings made during construction shall be recorded. Record shall show changes in:
 - a. Size, type, capacity, etc. of any material, device or piece of equipment.
 - b. Location of any device or piece of equipment.
 - c. Location of any outlet or source in building service system.
 - d. Routing of any piping, ducts, sewers or other building services.
2. These Drawings shall also record the location of all concealed water piping, sewers, wastes, vents, ducts and other piping, by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building. Drawings shall also indicate invert elevation of sewers and top of water lines.
3. Drawings shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
4. After the project is completed these Drawings shall be delivered to the Architect in good condition, as a permanent record of the installation as actually constructed.

1.7 COORDINATION AND SUPERVISION

- A. Examine work of other trades which comes in contact with or is covered by this work. Do not attach to, cover, or finish against any defective work, or install work of this Division in a manner which will prevent other trades from properly installing their work.
- B. Before installing work, report any interferences between work of this Division and work of other Divisions to Architect as soon as discovered. Architect will determine which work must be relocated or make adjustments to maintain clearance, maximum headroom, and to avoid conflict with other work. If any work is installed so that the architectural design cannot be adhered to, Contractor is liable for cost of making such changes as Architect may require.
- C. Cooperate with all other trades to avoid interferences and delays.

1.8 COORDINATION DRAWINGS

A. Description of Work

1. As part of his responsibility for coordinating work on the project with other Contractors, the M.C. shall take the lead in preparation of Coordination Drawings for the project.
2. The basis of the Coordination Drawings shall be the sheet metal fabrication drawings with input required from other Trades Contractors who have a necessity to coordinate their work with others. The Mechanical Contractor shall set up the Coordination drawing based on the Architectural ceiling plan, and overlaying the structural drawings. The base coordination drawing provided to each contractor shall indicate the finished floor reference point, bottom of steel for all steel beams, the location of all lintels, the ceiling height and the type of all ceilings, the location of exposed construction and areas which are open to above. Each base drawing shall include a reference point to be used as an Xref insertion point.
 - a. Drawings shall be setup such that each trade uses a unique color.
 - b. Each trade shall utilize a unique layer prefix. (i.e SM-XXX, ME-XXX, PL-XXX)
 - c. No trade specific items or text shall be drawn on layer 0.
 - e. The use of Xref's is strongly encouraged. Each trade shall mark their Xref's with a consistent reference point to facilitate alignment and insertion of Xref's to the base drawing's reference point.
 - f. All trades shall coordinate work utilizing AutoCAD 2000 file format or later.
3. The Coordination Drawings shall be prepared at a scale of $\frac{1}{4}$ " - 1'0".
4. The Coordination Drawings shall show the relationship of all items of Heating, Ventilating and Air Conditioning equipment, ductwork and piping, plumbing equipment and piping, sprinkler equipment and piping, and electrical systems. Items shown on the coordination drawings take precedence over items not shown on the coordination drawings.
 - a. Also to be shown are such items of electrical systems which affect the location of Heating, Ventilating, Air Conditioning and plumbing equipment, piping ductwork and air outlets.
 - b. The use of these drawings to accurately designate the locations of hangers and support devices is vital to the successful installation of all required items without conflict.
 - c. Costs for the relocation of any item of work due to the failure of prior coordination, will be the responsibility of the Contractor failing to provide the correct information, or information in a timely manner, regarding coordination requirements for his respective systems. No extra compensation will be made.
 - d. The Construction Manager shall present a schedule for the preparation of

the Coordination Drawings. The schedule shall be developed with input as required from all trades that are required to participate in the coordination drawing process. Every effort shall be made by the construction manager and each trade to create a schedule that is mutually agreeable and beneficial. Each contractor shall sign off on the schedule as acknowledgement of the schedule.

- f. Unless mutually agreed to by each contractor, the order of drawings shall be as follows:
 - 1) HVAC ductwork
 - 2) Plumbing
 - 3) HVAC piping
 - 4) Fire Protection
 - 5) Electrical

 - g. Unless mutually agreed to by each contractor, the order of irresolvable conflict resolution shall be as follows:
 - 1) Gravity Storm and Sanitary lines
 - 2) Ductwork
 - 3) HVAC piping
 - 4) Plumbing excluding gravity drains
 - 5) Electrical (excluding lighting which is architectural and requires Architectural approval for deviation from design layout.
 - 6) Fire Protection
- B. All Contractors shall provide the M.C. with necessary and sufficient information as required and as requested to permit the development of the Coordination Drawings.
- 1. This information shall include, but is not limited to, the following:
 - a. Framing and suspension details for ceilings, mechanical, sprinkler, plumbing and electrical items.
 - b. Plumbing lines
 - c. Fire lines and sprinkler head locations
 - d. Location and site of electrical pull boxes, conduits, bus ducts, cable trays and lighting fixtures and fixture hangers.

 - 2. After completion of the Coordination Drawings, the M.C. shall issue copies to all other Contractors concerned and obtain their final agreement. Each trade contractor shall signify agreement and acceptance of the Coordination Drawings by signing each of the drawings.

 - 3. After approval, the M.C. shall provide copies of "approved" Coordination Drawings to the other Contractors, the Architect, and the Engineer.

1.9 COORDINATION MEETINGS

- A. The coordination meetings held by the HVAC Contractor and attended by representatives of each of the Trade Contractors and the Construction Manager are to be held at a minimum of

once a week to resolve any and all conflicts in the placement of the work of each of the other contractors. Any and all costs associated with these meetings and the relocation in routing and elevation of any given line resulting from this coordination process is to be included in the base bid. No items may be resized or exposed items relocated without the approval from the Architect/Engineer. The HVAC Contractor is to take minutes from these meetings and distribute them to all attendees of the meeting and the Construction Manager.

- B. HVAC Contractor shall notify Construction Manager in writing if:
 - 1. Irresolvable conflicts appear. See also Coordination Drawings.
 - 2. Code violations occur.
 - 3. Structural beams, joists/trusses and columns.
- C. Attendance by all Prime Trade Contractors is mandatory. Attendance by Prime Trade Sub-Contractors is also mandatory if sub-contractor is performing work that requires coordination.
 - 1. The Construction Manager shall have the final decision as to the frequency and location of coordination meetings in order to meet the construction and coordination schedule.

1.10 COMPOSITES

- A. The HVAC Contractor is required to compile the final electronic files and submit final, color-coded coordination drawings to the Construction Manager. These final composite drawings shall be signed and dated by all Trade Contractors identified above to indicate their approval of the coordination information furnished in the coordination drawings prior to submission to the Construction Manager. Submittal of the final color-coded coordination drawings shall be made in accordance with regular submittal procedures. The submitted signed-off coordination drawings shall be sent to the Architect for FILE RECORD ONLY.
 - 1. Submittal shall include the following:
 - a. $\frac{1}{4}$ "=1'-0" scale drawings printed in color.
 - b. CD-R containing original CAD files of composites/coordination drawings.
- B. The HVAC Contractor shall be responsible for distributing prints of the final signed-off composite drawings to each of the Prime Trade Contractors and the Construction Manager within two weeks of the final coordination meeting.
- C. Minimum Requirements
 - 1. HVAC:
 - a. All equipment
 - b. Ductwork
 - c. Diffusers, registers and grilles
 - d. Piping

- e. Valves
 - f. Controls
 - g. Access doors
 - h. Duct access doors
 - i. Accessories
2. Plumbing:
- a. Equipment
 - b. Piping
 - c. Valves
 - d. Service piping
 - e. Access doors
 - f. Accessories
3. Fire Suppression:
- a. Equipment
 - b. Piping
 - c. Valves
 - d. Service piping
 - e. Access doors
 - f. Accessories
4. Electrical:
- a. Light fixtures
 - b. Junction boxes
 - c. Cable tray
 - d. Raceway
 - e. Panelboards
 - f. Transformers
 - g. CCTV systems
 - h. Access doors
 - i. Accessories
5. Security Systems/Technology Systems:
- a. Security sensors
 - b. Junction boxes
 - c. Cable tray
 - d. Raceway
 - e. Panelboards
 - f. UPS systems
 - g. CCTV systems
 - h. Paging and intercom systems
 - i. Accessories
6. Fire Alarm:

- a. Detectors
- b. Junction boxes
- c. Panels
- d. Raceway
- e. Conduit

7. General Construction:

- a. Ceiling grid and panel layout showing light fixtures, sprinkler heads, supply and return grills, detectors, and all other items exposed to view in ceiling system.
- b. Miscellaneous steel support and bracing members.
- c. Structural steel and joists

D. Prepare sections and details locating concealed material and equipment.

1.11 PROVISION FOR LATER INSTALLATION

- A. When mechanical work cannot be installed concurrent with building construction, provide sleeves, inserts, etc., as necessary for installation at a later date. Location of chases and other openings through construction is the Contractor's responsibility.
- B. Become acquainted with nature of construction against which this work attaches. Review structural drawings for coordination of openings. Cut no structural members or slabs without Architect's written instructions.

1.12 PROTECTION

- A. When setting up pipe shop, cutting, threading machines, protect area against staining, abrasion. Cost of correcting any such condition will be charged against the respective Contractor.
- B. Protect surfaces from construction activity including chips, cutting oil, welding, cutting spatters, paint droppings, insulation adhesive, duct sealant, etc.

1.13 PRODUCT HANDLING

- A. Pay all costs for transportation of materials and equipment to the job site.
- B. Provide all scaffolding, tackle, hoists and rigging necessary for placing mechanical materials and equipment in their proper place. Scaffolding, hoisting equipment shall comply with applicable Federal, State, and Local regulations. Remove temporary work when no longer required.
- C. Arrange for packaging of equipment which must be hoisted so that there will be no damage

or distortion caused by hoisting operation.

- D. Store all materials in a dry, clean location until building is ready to receive specified items. Protect all materials from dirt and moisture.

1.14 OPERATING INSTRUCTIONS

- A. Provide to Owner after all equipment is in operation and at an agreeable time, competent instructors for the purpose of training Owner's personnel in all phases of operation and maintenance of equipment and systems. The instruction period shall be a minimum of eight(8) hours for the mechanical system work. The time shall be selected by the Owner.

1.15 DAMAGE AND EMERGENCY REPAIRS

- A. Assume responsibility for any damage caused by the systems being installed under this Contract. Repair all damage without extra cost to Owner.
- B. Owner reserves the right to make emergency repairs as required, without voiding Contractor's guarantee or relieving him of responsibility during the construction and warranty period.
- C. Restore roads, grounds, insulation, piping, building, fixtures and equipment, etc., to their original condition whenever this work causes damage.

1.16 GUARANTEE AND WARRANTIES

- A. Warrant that equipment and work is provided in accordance with good engineering practice and that all equipment will meet requirements specified. Any equipment failing to perform or function as specified shall be replaced with complying equipment, without cost.
- B. Guarantee against defects in workmanship and materials; make good, repair or replace any defective work, material or equipment within one year from date of acceptance.
- C. Guarantee air conditioning equipment refrigeration compressors for five years.
- D. Guarantees on products will commence on the date of substantial completion; not from the date the products are put into operation.

1.17 EQUIPMENT OR SUBSTITUTIONS

- A. Specified products and substitution: Bids shall be based upon the specified product or listed alternative. Documents are based on the products specified by type, model and size and thus establish minimum qualities, which substitutes must meet to qualify as acceptable. Proof of equality rests with the Bidder.

- B. Contractor shall include any changes in foundation, electrical wiring, conduit, piping and ductwork required if other than first named manufacturer is used. Changes to the scope or requirements of other Contractor's work necessitated by using equipment other than the first named basis and design shall be the responsibility of this Contractor.
- C. Substitution may be offered for consideration under the following conditions:
 - 1. The proposed substitution is equal or superior to the specified item in all respects. Indicate the additional cost or credit. No later substitutes will be permitted.
 - 2. Extended delivery schedules on specified items, which would impact the impact the progress schedule, will be cause for consideration of substitutions. The Contractor must show proof of delay in delivery from the manufacturer.
 - 3. Drawings and Specifications are based on the requirements and layouts for the equipment of the first named manufacturer. Contractor shall prepare new layouts of the proposed substitution to be used for approval.

1.18 MATERIALS

- A. All materials shall be new and of the best quality with the same brand of manufacturer used for each class of material or equipment.
- B. Provide incidental concrete, reinforcing steel, masonry, mortar, miscellaneous steel, painting and the like required to complete mechanical installations; perform in manner specified in applicable Project Specifications.

1.19 INSTALLATION REQUIREMENTS

- A. Location of piping, equipment, ducts, etc., on the drawings are diagrammatic; indicated positions shall be followed as closely as possible, exact locations shall be subject to building construction and interferences with other work. Where additional offsets in pipes or ducts are required to obtain head room or to avoid conflict with other work, they shall be provided without extra charge. Take all measurements and determine all elevations at the project site.

In general, conceal piping, equipment, ducts, etc. Architect reserves the right to make minor changes in location of any part of the work up to the time of roughing-in without additional cost.

- B. All materials and equipment shall be provided in a neat and workmanlike manner by competent specialists for each subtrade. The installation of any materials and equipment not meeting these standards will require removal and reinstallation at no additional cost.
- C. Piping, ducts, etc., must be located to ensure maximum accessibility.
- D. Provide all materials in accordance with best engineering practice and in conformity with manufacturer's printed instructions. Provide complete auxiliary piping, water seals, valves,

electric connections, controls, etc., as recommended by manufacturer or required for proper operation.

- E. Provide all cutting and patching in construction as necessary for this work. Have cutting done by skilled mechanics as carefully as possible, and with as little damage as possible. Have patching done by first-class mechanics, skilled in the several trades.

1.20 PAINTING

- A. Finish painting is included under Division 9 - Finishes, except where specifically called for under this Division.
- B. Certain painting specified as part of the Mechanical Trades Work is included herein.
- C. Materials and equipment provided under this Division shall be left free from dirt, grease and foreign matter, ready for painting.
- D. No equipment or piping shall be painted before being tested.
- E. Damaged surfaces of prefinished materials and equipment shall be touch-up painted to match existing finish.

1.21 IDENTIFICATION

- A. Identify each pipe in Equipment Rooms and above accessible ceilings as follows:
 - 1. Color code ID bands or marker backgrounds to identify contents of pipe in conformance with Scheme for Identification fo Piping Systems, ANSI A13.1 and OSHA.
 - a. Fire protection: red background/white letters
 - b. Safe liquids: green background/white letters
 - c. Safe gases: blue background/white letters
 - 2. Provide identifying band near each valve and fitting, on both sides of pipes passing through walls, on long runs at not over 20 foot intervals, at each branch connection and at each riser.
 - 3. A permanently legible tag shall be used for pipes or less than ¾" diameter.
 - 4. Manufactured labels and color bands shall be applied to clean, dust free surfaces so as not to loosen. Acceptable manufacturers: Brady, Emed Company, Inc., or Seton.

1.22 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment and ducts as to nature of service and system number corresponding to designation on the drawings, by stenciling with 1" high letters or attaching two-color engraved plastic name plates.

| <u>Item</u> | <u>Type Identification</u> |
|---------------------------------|----------------------------|
| Control Panels | Nameplates |
| Supply, Return and Exhaust Fans | Stencil |
| Switches, Pilot Lights (Remote) | Nameplate |

- B. Lettering shall include horsepower, voltage rating and service designation.
- C. Name plates shall be laminated phenolic with a black surface and white core. Use 1/16" thick material for plates up to 2" by 4". For larger sizes use 1/8" thick material.
- D. Lettering shall be condensed Gothic. The space between lines shall be equal to the width of the letters. Use ¼" minimum height letters which occupy four to the inch.

1.23 VALVE TAGS

- A. Provide a numbered engraved plastic tag approximately one (1) inch in diameter, attached to each valve with non-rusting "S" hook of adequate size. Local stop and shut-off valve to an equipment item need not be tagged.
1. Engrave each tag with number and service designation valve. Prefix numbers with "P" for Plumbing, "H" for Heating/Cooling and "F" for Fire Protection. In color coded lines color shall correspond to service identification color.
 2. Accurately record numbers and locations on the "Record" drawings.
 3. Provide typed valve directories in framed, plexiglas covered enclosure, identifying each valve as to size, type, service, and location. Mount on wall of equipment room.
 4. Where valves occur above lay-in ceilings, fasten push pins to the panel below the valve. The push pin marker shall match the ceiling color.

1.24 OPERATING AND MAINTENANCE MANUAL

- A. Prepare two (2) complete Operating and Maintenance Manuals in hardback binders.
- B. Service manuals shall be assembled into one book. Bind the written operating instructions, shop drawings, equipment catalog cuts and manufacturer's instructions into a hard-backed binder where they can be accommodated into 8-1/2" x 14" size. Material to be assembled as follows:

First page -- Title of Job, Owner, Address, Date of Submittal, Name of Engineer, and Name of Construction Manager.

Second Page -- Index

First Section -- A copy of each Shop Drawing with an index at the beginning of the section.

Second Section -- A copy of each manufacturer's operating instructions with an index at the beginning of the section. Indicate step-by-step procedure for start-up and shutdown of each system.

Third Section -- A list of all equipment used on the job, Contractor's purchase order numbers, suppliers' names and addresses.

Fourth Section -- Copies of each control wiring diagram utilized in the installation.

Fifth Section -- Copies of all tests, recordings, contractor tabulations and vendors reports, etc.

Sixth Section -- Copies of all warranties and guarantees.

Seventh Section -- Complete copy of valve chart indicating; sizes; flanged, welded or soldered; manual or automatic; valve number and location.

Eighth Section -- Maintenance and lubrication schedules and instructions.

Ninth Section -- Belt sizes, types, and lengths.

Tenth Section -- Copies of Contractor's punch list, Architect's punch list and final inspection - complete when items on punch list are completed. Dated and signed receipt that all keys have been turned over to proper authorities. Copies of all certificates of equipment demonstrations and receipts indicating that all special tools and appurtenance have been turned over to proper authorities.

- C. Deliver to the Architect all special tools and appurtenances for proper operation and maintenance of the equipment provided.

1.25 CLEANING UP

- A. All rubbish resulting from the work shall be removed from the premises by the Trade which produced it, as fast as it accumulates. At all times, keep premises in neat and orderly condition. Follow explicitly any instruction of the Architect in regard to storing of materials, protective measures and disposing of debris.
- B. Upon completion of work, each Contractor shall remove from the site all tools, equipment, surplus materials and rubbish. Thoroughly clean all piping, fixtures and equipment.
- C. Each Contractor shall cooperate with each other in final cleaning. Also, see the General Conditions.
- D. Replace all throw-away filters used during construction with proper system filters at the

completion of the work.

- E. Provide chemical cleaning for piping systems with precleaning chemicals to remove pipe dope, slushing compounds, oils, welding slag, loose mill scale and other extraneous materials.
 - 1. Chlorinate the domestic water system. Flush out system first, then hold a solution mixture of 500 ppm of chlorine in the system for a 24 hour period. Drain system and flush. After flushing, chlorine residual shall not be in excess of 0.5 ppm at 4 widely spaced check points. Chlorination procedures shall conform to AWWA Specification C651 and be accepted by the local health department. Repeat chlorination if necessary until accepted.
- F. After initial period of operation, clean all strainers, traps and dirt legs.

1.26 LUBRICATION, PACKING AND SUPPLIES

- A. Properly lubricate all equipment before it is started.
- B. Check each shaft containing a packing gland for condition by backing packing gland off and examine for proper grade, amount and type of packing as recommended by manufacturer.
- C. Maintain all lubrication gaskets and packing during construction; assure that at the time of substantial completion all are in first class condition.
- D. Install initial charge of refrigerant and any other supplies required to place equipment in operation.

1.27 TESTS AND ADJUSTMENTS

- A. Obtain all inspections required by law, ordinances, rules, regulations of authorities having jurisdiction. Furnish certificates of such inspections. Pay all fees and provide all equipment, power and labor necessary for inspections and tests. Do not consider work under this Contract complete until Contractor has obtained required inspections, performed tests, made necessary adjustments and has submitted satisfactory evidence of successful completion.
- B. During testing period, maintain on the job a competent foreman thoroughly familiar with all phases for as long a period as required to thoroughly adjust all systems and demonstrate that they are functioning properly.
- C. Perform all tests, including but not limited to those specified. Make necessary adjustments to obtain specified equipment and system characteristics.
- D. No piping work, fixtures or equipment shall be concealed or covered until they have been inspected and approved by the authority having jurisdiction. All work shall be completely installed and tested as required by this contract and ordinances and shall be leak-tight before inspection is requested. All tests shall be repeated to the satisfaction of those making the

inspection and the Architect.

- E. In general, pressure tests shall be applied to piping only before connection of equipment. In no case shall equipment be subject to pressure exceeding their rating. Defective work shall be promptly repaired or replaced and tests shall be repeated until the particular system and component parts thereof pass the test.
- F. Any damages resulting from tests shall be repaired or damaged materials replaced at no cost and to the satisfaction of the Architect.
- G. If Contractor does not promptly repair damages and defects, Architect reserves the right to remedy such damages and defects at the Contractor's expense.

H. Pressure Tests:

- 1. All piping shall be given the following pressure test without appreciable pressure drop (5 PSIG).

| SERVICE | MEDIUM | (PSI) | HRS. |
|-----------------|--------|-------|------|
| Domestic Water | Water | * | * |
| Fire Protection | Water | 200 | 2 |
| Gas | Air | 50 | 24 |
| Vacuum | Air | 125 | 24 |
| Oxygen | ** | 150 | 24 |
| Nitrous Oxide | ** | 150 | 24 |

* AWWA Standard C600

** per NFPA-99

Sanitary and storm sewers per State Plumbing Code or Local Authority.

- 2. Correct minor leaks in welded joints by chipping out weld and rewelding. Correct leaks in screwed joints by replacing thread or fitting or both. Caulking of threaded joints is not permitted. Repair leaks in copper tubing by sweating out joints, thoroughly cleaning both tube and fitting and resoldering.
- 3. Contractor shall be responsible for completely draining the systems after hydrostatic tests are performed.

I. HVAC System Adjustments and Balance

- 1. Provide the services of a certified A.A.B.C. test agency to test and balance HVAC systems. Conduct all test in accordance with Associated Air Balance Council, National Standards for Field Measurements and Instrumentation.
- 2. Do not begin adjustments until systems have been completed and are in full working order. Put all heating, ventilating, exhaust and air conditioning systems and equipment into full operation of same during each working day fo testing and

balancing.

3. Perform tests and balance systems in accordance with following requirements:
 - a. Test and adjust all air handling systems for design flow of supply, return, relief, exhaust and outside air to within 5% of design requirements.
 - b. Identify each register as to location and area; in readings and tests of registers, tabulate required velocity and CFM, and test velocity and CFM after adjustment. Adjust supply registers for proper air distribution pattern to eliminate drafts.
 - c. For each piece of air handling equipment, list fan data, motor and drive. Test and record fan motor horsepower, full load amperes, fan speed, system suction and discharge static pressure. Determine CFM by means of velocity traverse at a minimum of three fan diameters from the fan outlet.
 - d. Set minimum outside air damper position by relationship to mixed air temperature.
 - e. Calibrate all temperature control and other automatic devices and thoroughly test. Guarantee all instruments to function on a variation of plus or minus 1-1/2 degrees and make adjustments to achieve this result during first year without cost to Owner.
 - f. Furnish 3 AABC certified copies of balancing results.
 - g. The Air Balance Contractor shall verify that the Natatorium is operating under a slight negative pressure. If the unit is providing positive pressure to the Natatorium, the Balance Contractor shall make necessary speed changes including all belts and sheaves to provide necessary exhaust from the space to provide negative pressure.

END OF SECTION 15010

SECTION 15050 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instruction to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.

1.2 WORK INCLUDES

Pipe and Fittings
Valves
Strainers
Traps
Unions
Thermometers
Pressure Gauges
Floor, Ceiling and Wall Plates
Sleeves
Inserts, Hangers and Supports
Access Doors
Electrical Connections
Vibration Control
General Piping
Joints
Expansion
Welding

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Mechanical General Provisions: Division 15
- B. Insulation: Division 15
- C. Plumbing: Division 15
- D. Fire protection: Division 15
- E. Heat Transfer: Division 15
- F. Air Distribution: Division 15
- G. Controls and Instrumentation: Division 15

1.4 SUBMITTALS

- A. Refer to Section 15010.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings

A/C Condensate Drain - Type "L" hard copper.

Domestic Water (3" and Smaller) - Type "L" hard copper.

Domestic Water (Underfloor) - Type "K" soft copper without joints.

Gas (Inside Building) - Schedule 40 black steel. Approved CSST.

Fire Protection Piping - Per NFPA-13 standards.

Fittings for black steel pipe, except as specified for fire protection, gas shall be 125 lbs., black cast iron screwed fittings on sizes through 2" and factory formed welding fittings on sizes over 2".

Fittings for fire protection piping shall be per NFPA-13 standards.

Fittings for gas piping shall be 150 lbs., steam working pressure malleable iron screwed fittings on sizes through 2" and factory formed welding fittings on sizes over 2" Fittings for CSST shall be per the manufacturer's recommendations. Submittals shall include a copy of at least one manufacturer certified installer's certification card from an employee of the installing contractor. The piping sizes on the drawing shall refer to an equal EHD (equivalent hydraulic diameter) of CSST pipe or the next largest EHD CSST.

Fittings for copper pipe shall be wrought copper solder joint type. Where a silver brazing alloy is used to join pipe and fitting, fittings shall be suitable for brazing.

Fittings for galvanized steel pipe shall be 150 lbs., steam working pressure, galvanized malleable iron screwed fittings.

Domestic Water Piping (hot water, cold water, hot water return) shall be of the quality as listed above. Fittings shall be wrought copper conforming to ASTM B16.22. At the contractor's discretion, grooved copper piping with ductile iron or bronze couplings and EPDM gasket may be used as an option. At the contractor's discretion, Copper press fittings may be used as an option per ASTM B16.18 or ASTM B16.22. O-Rings shall be EPDM.

Building Sewers and Drains (Underground) - Storm and sanitary sewers to 5'-0" outside building walls shall be service weight cast iron, bell and spigot, soil pipe, with Tyler "Ty-Seal" or equal, neoprene pipe gaskets or schedule 40 PVC sewer pipe and fittings per ASTM D2665-78 with solvent weld joints. Waste and vent lines from kitchen equipment above 140 degrees shall be cast iron hub and spigot.

Soil, Waste, Vent and Drain Piping (Above Ground Interior) - No-hub cast iron pipe and fittings made in accordance with Cast Iron Soil Pipe Institute Standard 301-72 or schedule 40 PVC drain waste and vent pipe and fittings with solvent weld joints per ASTM D2665-78.

B. Valves

1. Valves shall be of the same manufacture where possible and equivalent to those manufactured by Nibco, Jenkins, Fairbanks, Powell, Milwaukee, Keystone, DeZurik or Hammond and withstand minimum 125 lbs. steam working pressure.
2. Gate valves 2-1/2" and larger: iron body bronze mounted, outside screw and yoke, rising spindle pattern, with flanged ends, solid wedges, and bronze stems. Flanges to be faced and drilled to conform to ASME standards. Gate valves 2" and smaller: screwed end, brass wedge type, may be non-rising stem.
3. Valves in water piping 2" and smaller: full port ball valves with bronze body and screwed ends, min. 150 lbs. SWP. Valves used for shut-off and balancing shall be equipped with memory stop.
4. Valves in water piping 2-1/2" and larger: butterfly with malleable or cast iron bodies, stainless steel stems, aluminum bronze discs, and EPDM replaceable seats, min. 175 lbs. SWP. Valves: lug type with lug drilled and tapped. Operators: on-off throttling lever handles on sizes 2-1/2" to 6", totally enclosed worm gear or Acme screw operators with hand wheel on sizes 8" to 20". Valves used for shutoff and balancing shall be equipped with memory stop.
5. Horizontal check valves 2" and smaller: swing type check with bronze body; 2-1/2" and larger, iron body, screwed or flanged ends, with ground joint seats and discs.
6. Vertical check valves shall be globe type center guided silent check valves as manufactured by Mueller Steam Specialty, Smolensky, or Williams Hager.
7. Relief valves shall be Bell & Gossett, Watts, or McDonnell Miller ASME.

C. Unions

1. Unions in steel piping 2" and smaller, malleable iron, ground joint brass to iron seat suitable for 150 psi SWP. Galvanized or black as required.
2. Unions in copper piping 2" and smaller, cast brass solder fittings with machined and lapped seats suitable for 125 psi working pressures.
3. Unions on all piping 2-1/2" and larger shall be provided by use of flanged connections. Gaskets used with flanged fittings shall be 1/16" thick, ring type, compressed graphite sheet.
4. Connections between screwed piping and tubing in hot and chilled water systems shall be made with wrought copper adapters.
5. Connections between ferrous and non-ferrous piping in domestic water systems shall be made with dielectric unions.

D. Thermometers

1. Provide thermometers in piping at following locations:
 - a. Domestic hot water supply main.
 - b. Domestic hot water storage tank.
 - c. Where additionally shown on drawings.
2. Thermometers: mercury in glass type with 9" Fahrenheit scale of proper range for service indicated, glass covered case with magnified mercury column, separable well, straight or angle mounted as required.
 - a. Bi-metal dial type thermometers may be supplied in lieu of mercury type.
 - b. Thermometers located below 6'-0" level: mercury type with 9" scale, forward or straight type as required by job conditions. Thermometers serving locations above 6'-0" level, to be dial type with remote bulb. Mount 4" diameter dials 5'-6" above floor on bracket at appropriate location.
 - c. As part of temperature control work provide a thermometer adjacent to every capillary or insertion type thermostat.
3. Acceptable manufacturers: Trerice, Taylor, American or Palmer.

F. Pressure Gauges

1. Install gauges in the suction and discharge of the heating pumps and all pumps on plumbing system. Provide gauges having proper ranges as required by conditions. Gauges to have 6" dia. dials, cocks, snubbers, and siphons, as manufactured by Trerice, American Consolidated, Marsh or Ashcroft.

G. Floor, Ceiling, and Wall Plates

1. Fit all pipe passing through walls, floors, or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish make escutcheons prime painted; otherwise make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.

H. Sleeves

1. Where pipes pass through masonry or concrete partitions, or rated fire partitions other than masonry, set machine cut steel pipe sleeves 1" larger than outside diameter of pipe, with ends of sleeves flush with partition faces.
2. Where pipes pass through exterior walls below grade, set Schedule 40 steel pipe or manufactured castings or sleeves 1-1/2" larger than O.D. of pipe. The pipe to wall penetration closure shall be made with "Link-Seal" as manufactured by the Thunderline Corp.
3. Where pipes pass through floors, set Schedule 40 galvanized steel pipe sleeves 1" larger than O.D. of pipe. Top of sleeve to be 4" above finished floor in machine rooms and wet floor locations.

4. Where pipes are insulated, provide sleeves large enough to allow insulation to pass through sleeve. Center pipes in sleeves.
 5. Set sleeves true to line, grade; position and plumb or level and so maintain throughout construction period.
 6. Where concrete or masonry floors and walls are core drilled for pipe passage, steel sleeves are not required.
 7. Seal opening between pipe and sleeve or opening as required maintaining the integrity of the fire rating of all walls and floors.
- I. Inserts, Hangers, and Supports
1. Provide all inserts, hangers, anchors, guides and supports to properly support and retain piping, ductwork and conduits; to control expansion, contraction, anchorage, drainage and prevent sway and vibration. Piping shall be so supported as not to place a strain on valves or equipment.
 2. Provide:
 - a. Inserts for support of work in concrete construction.
 - b. Forged steel beam clamps when attaching to steel construction.
 - c. Supplementary angles, channels, plates, etc. Where supports are required between building structural members, span the space and attach to building structural members by welding, bolting or with concrete anchors.
 - d. Rods, angles, rails, struts, brace plates, platforms, etc., required for suspension or support of piping, conduit and equipment.
 - e. Hangers, rollers, threaded rods, turnbuckles, saddles, insulation protectors, anchors, etc., and all miscellaneous specialties for the attachment of hangers and supports to the structure.
 3. Support individual piping from hangers as manufactured by Grinnell, Michigan Hanger Co., Modern or Fee and Mason.
 - a. Uninsulated piping 2" and smaller - Grinnell Fig. 97 malleable iron adjustable nut and wrot ring.
 - b. Uninsulated piping 2-1/2" and larger - Grinnell Fig. 260, Carbon Steel adjustable wrought clevis type.
 - c. Copper tubing (uninsulated) - Grinnell Fig. CT-97 carbon steel ring and malleable iron adjusting nut completely copper plated.
 - d. Insulated piping 2" and smaller - 18 ga. galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long with Grinnell Fig. 260 clevis type pipe attachment.
 - e. Insulated piping 2-1/2" and larger (except cold piping) - Use pipe covering protection saddle. Support clevis type except where roller support required.
 - f. Rollers - Where thermo-movement causes a hanger rod to deviate more than five degrees from the vertical or where longitudinal expansion may

cause a movement of more than 1/2" in the piping, use and install roller hangers or chairs, Grinnell Fig. 181, 171, or 175.

4. Hanger Spacing (steel pipe)

| PIPE SIZE | MAXIMUM SPACING | MINIMUM ROD |
|--------------|-----------------|-------------|
| Up to 1" | 6' | 3/8" |
| 1-1/4" | 8' | 3/8" |
| 1-1/2", 2" | 10' | 3/8" |
| 2-1/2", 3" | 12' | 1/2" |
| 4", 5" | 14' | 5/8" |
| 6" | 16' | 3/4" |
| 8" | 18' | 7/8" |
| 10" and over | 20' | 1" |

Provide additional hanger support within two feet of each elbow and at valves, strainers and other equipment in pipe lines.

5. Copper pipe shall be supported at intervals of not over 10 feet for 1-1/4" and larger, and not over 5 feet for 1" and smaller. Additional supports shall be provided where necessary to maintain proper alignment.
6. Cast iron soil pipe hung from building construction shall be supported at intervals of not over 5 feet next to hub. Additional supports shall be provided where necessary to maintain proper alignment and grade.
7. Plastic pipe, where specified, shall be provided with Fee and Mason Fig. 108 plastic pipe hanger and Fig. 109 plastic pipe channel. Continuous support channel.
8. Support vertical pipe risers with friction clamps at least at alternate floors.
9. Trapeze hangers may be used for multiple runs of piping and shall consist of a channel with adjustable hanger rods. The smallest pipe supported shall determine hanger spacing. All piping shall be free for independent movement on the trapeze hanger. Insulation protection saddles shall be as specified for individual pipe support.
10. Do not suspend a pipe from another pipe or ductwork. Do not support ceiling framing or lighting from piping or ductwork.
11. Sprinkler piping shall be supported as per NFPA 13, Chapter 3-14.
12. Support ductwork with 16 ga. galvanized steel strap hangers, steel rods, or steel angle trapeze hangers per SMACNA standards. Maximum spacing 8'-0".
13. All hangers, supports and clamps shall be non-corrosive in the pool, pool equipment and locker room areas.

J. Access Doors

1. Provide access doors, frames (for installation by others) in all locations where necessary for access to concealed valves, dampers, other equipment requiring service or inspection. Where practical group valves, traps, dampers, etc., so as to be accessible from a single door.
2. Doors: flush type, 14 ga. steel; frames: 16 ga. steel. Supply with factory prime coat finish. Equip doors with invisible hinges and catches. Units shall be Milcor, Newman Bros. Inc., or equal. Supply style which is compatible with the specific wall or ceiling construction. Supply in factory prime coat finish. Doors shall be sufficiently large for access to equipment, but not less than 16" x 12".
3. Access doors installed in fire rated construction shall be U.L. classified fire rated access doors, rating one and one-half hour "B" label.

K. Electrical Connections

1. Refer to those portions of the Electrical Drawings and specifications that establish characteristics of electrical service and furnish equipment to operate on that service.
2. The Mechanical Contractor shall furnish all starters unless noted otherwise. Starters to be provided with proper NEMA enclosures, surface or flush application as required. Where equipment has magnetic starters furnished as an integral part of the equipment, the Mechanical Contractor shall furnish necessary disconnect switches.
3. Provide coordinated wiring diagrams for motor equipment of heating, ventilating and plumbing and temperature control conforming to system operation specified. Provide line diagrams, power diagrams, and terminal connections. Submit all such drawings as shop drawings.

L. Drives and Guards

1. For each item of belt driven equipment, provide an adjustable drive sheave with adjustable limits plus or minus 12- 1/2 percent, based on a service factor of 1.5 as applied to motor nameplate rating. Drives of one horsepower and over shall have at least two belts, with all multiple belt sets matched. Non-adjustable drive sheaves will be acceptable for motors of 30 HP and over.
2. Provide substantial drive guard for each belt drive secured to the equipment. Provide openings in skirt guards for insertion of revolution counter at drive sheave and driven sheave centers. Provide conveniently removable coupling guard for direct driven equipment.
3. For each item of direct driven equipment that is not of extended shaft or close-coupled design, provide an approved type flexible coupling.

4. Provide a typed list of belt drives, listing each item with pitch diameter, bore size, and keyway dimensions of each sheave and manufacturer's replacement belt numbers. Bind lists in Operating and Maintenance Manuals.
5. Provide all necessary changes in drive sheaves and/or belts as required to obtain specified air deliveries.

M. Vibration Control

1. Provide vibration isolating mountings to isolate from the structure, by means of resilient vibration and noise isolators, mechanical equipment having rotating or reciprocating parts. Isolators shall be supplied by a single source and shall be guaranteed by the manufacturer to provide isolation efficiencies in accordance with this specification. Selection shall be based on equipment purchased, power dissipated, frequency, weight distribution and nature of the building structure. Mountings shall be designed to permit attachment to the equipment base or pad and to the structure and shall be selected for uniform deflection allowing for unequal weight distribution.
2. Selections shall be made by the manufacturer of the mountings to provide a transmissibility not exceeding 10 percent. This Contractor shall provide inertia pads for equipment where called for on drawings. These shall consist of reinforced concrete pads of suitable shape, of weight 1-1/2 times the weight of the equipment and provided with weld plates or channels at the corners to which the mountings may be secured.
3. Vibration or noise created in any part of the building by the operation of any equipment furnished and/or installed under this contract will be prohibited and this Contractor shall take all precautions by isolating the various items of equipment from the building structure.
4. Mechanical equipment shall be isolated as follows:
 - a. Centrifugal fans, air conditioning and/or heating and ventilating units ceiling suspended, shall be suspended by threaded rods from the overhead structure. Resilient hangers incorporating steel springs and precompressed molded fiberglass inserts shall be incorporated into each supporting rod. The isolators shall be sized to provide minimum of 90 percent effective isolation.
5. Piping and ductwork shall be supported independently of the mechanical equipment and shall be isolated as follows:
 - a. All suspended piping in Mechanical Equipment Rooms and the first three hangers outside equipment rooms shall be supported from the overhead structure by threaded rods incorporating resilient hangers. Hangers shall contain steel springs and precompressed molded fiberglass inserts, designed for static deflections of between 1" and 1-3/4" under operation conditions.

- b. Flexible connections shall be used between ductwork and air handling equipment, and the ductwork attached rigidly to the structure.
6. Isolation efficiency shall be based on the lowest operating speed of the supported equipment. The isolator manufacturer shall provide, as a part of his submittal data, deflections and isolating efficiencies for the isolators supporting each piece of equipment. Isolators shall be manufactured by Mason Industries, Consolidated Kinetics or Amber Booth.

PART 3 - EXECUTION

3.1 GENERAL PIPING

- A. Provide shutoff valves at all branch connections to main, at all fixture groupings, each piece of apparatus and in mains to sectionalize the systems and elsewhere as indicated on plans.
- B. Install valves with stems at or above horizontal position.
- C. Install all valves and equipment with unions or flanges to facilitate removal.
- D. Provide hose end drain valves at all low points, trapped sections and on equipment side of all branch valves to permit draining of all parts of liquid piping systems. Install valves at high points of equipment and piping to allow venting.
- E. Pipe equipment drip bases to nearest drain.
- F. Locate covered piping a sufficient distance from walls, other pipe, ductwork or other obstacles, to permit application of the full thickness of insulation specified; if necessary use extra fittings and pipe.
- G. Use Dielectric Connectors where pipe materials change from ferrous to copper in domestic water systems.
- H. Make piping connections to equipment indicated.
- I. Plug open ends of pipe or equipment at all times during installation to keep dirt and foreign material out of system.
- J. Arrange and install all pipes, valves, cleanouts, access openings and equipment so as to be accessible for service. Locate equipment to maintain clearances for tube, coil pulling, periodic servicing.
- K. Unless otherwise specified, branch connections in welded steel piping less than 2/3 of main size shall be made with weldolets, butt or threaded type. Branch connections 2/3 of main size and larger shall be with weld tees, laterals or crosses. Shaped nipples are not acceptable.

- L. Make reductions in piping lines with reducing coupling or weld fitting reducer.

3.2 WELDING

- A. Install all pressure piping systems to conform to requirements of State Piping and Welding Codes where applicable.
 - 1. Any pipe welding not covered by code shall also be performed by certified welders according to code procedures.
 - 2. Construct, install and inspect all pressure piping systems in accordance with the requirements of Ohio Pressure Piping System Rules, Chapter 4101:8.

3.3 JOINTS

- A. All pipe must be reamed and cleaned before assembly. Apply pipe compound to male end of threaded joints. All welded joints shall be as hereinbefore specified. All soldered connections on copper lines shall be cleaned, fluxed and soldered with 95-5 solder, except where a silver brazing alloy is specified.
- B. Assemble black steel pipe 3" and larger with welded joints, 2-1/2" and smaller with welded or screwed joints at Contractor's option.
- C. Joints in hubless cast iron pipe shall be made with couplings as manufactured by Clamp-All Corporation - 24 ga., Type 304 stainless steel with high torque clamps, neoprene gasket. Gasket shall interlock with housing assembly to make slipfree joint.

3.4 EXPANSION

- A. Install all piping throughout the project with adequate allowance for expansion to prevent damage to building, equipment and piping. Provide anchors, loops or approved type expansion joints as required for complete control of movement. Make changes in directions with fittings.
 - 1. Make branch connections to mains for heating risers, radiators and domestic hot water risers with at least two (2) 90 degree elbows.
 - 2. Bullhead connections in any piping service are prohibited.
 - 3. Supplement all loops, joints, compensators, etc., with adequate guides located as close to loops and joints as possible to preserve alignment and pitch.
 - 4. Provide securely supported pipe anchors as required to control expansion, contraction in piping.
 - 5. Attach continuous radiation covers through elongated holes or by other means to

prevent buckling.

END OF SECTION 15050

SECTION 15250 - INSULATION

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.

1.2 WORK INCLUDES

- A. All labor, equipment, accessories, materials and services required to provide all insulation, fittings and finishes for piping, ducts and related mechanical equipment in the plumbing, heating, ventilating and air conditioning systems.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Mechanical General Provisions: Division 15
- B. Basic Materials and Methods: Division 15
- C. Plumbing: Division 15
- D. Heat Transfer: Division 15
- E. Air Distribution: Division 15

1.4 SUBMITTALS

- A. Submit shop drawings or descriptive literature for all insulation products to be used.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. All insulation material (insulation, jackets, adhesives, cements, mastics, sealers, coatings and finishes) shall have composite Fire and Smoke Hazard ratings as tested under procedure ASTM E84-91a, NFPA 255 and UL 723, not exceeding, as follows:

Flame Spread 25
Smoke Developed 50

- B. Provide the following insulation products as manufactured by Owens-Corning. Insulation products as manufactured by Armstrong, CertainTeed or Knauf are acceptable. Adhesives shall be Benjamin, Foster or equal.

1. OWENS-CORNING FIBERGLAS 25: ASJ/SSL HEAVY DENSITY PIPE INSULATION (see Insulation thickness schedule)

| <u>Service</u> | <u>Thickness Type</u> |
|-----------------------------|-----------------------|
| Domestic cold water | A |
| Horizontal storm conductors | A |
| Domestic hot water | B |
| Recirculating hot water | B |

(NOTE: Armstrong Armaflex SSA 2000 Pipe Insulation may be substituted for the Fiberglas Pipe insulation specified on service piping with temperatures up to 180 degrees F.)

- C. Schedule of "Fiberglas 25" pipe insulation thickness

MINIMUM PIPE INSULATION THICKNESS

| PIPE SIZE | TO 1" | 1-1/4" - 2" | 2-1/2" - 4" | 5",6" | ABOVE 6" |
|-----------|-------|-------------|-------------|-------|----------|
| TYPE | | | | | |
| A | 1/2" | 1/2" | 1/2" | 1/2" | 1/2" |
| B | 1/2" | 1" | 1" | 1" | 1-1/2" |

(NOTE: Pipe insulation thickness specified in the above schedule are based on products having a maximum "k" factor of 0.26 at a mean temperature of 75 deg.F. These thickness can be reduced for products having significantly lower "k" values and shall be increased for products having higher "k" values in order to produce equivalent or greater thermal resistance.)

1. OWENS-CORNING FIBERGLAS 705: 1" THICK ASJ EQUIPMENT INSULATION (Density 6 pcf) or ARMSTRONG AP ARMAFLEX SHEET AND ROLL INSULATION (3/4")

Service

Roof drain sumps

2. OWENS-CORNING ED-150 FRK 25: 2" THICK FACED DUCTWRAP

Service

Concealed supply air ductwork

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All insulation shall be installed over clean, dry surfaces. Insulation must be dry and in good condition. Wet or damaged insulation will not be acceptable. No insulation shall be applied prior to pressure test completion of the respective piping systems.
- B. All insulation shall be continuous through wall and ceiling openings, sleeves and pipe hanger locations.
- C. Fiberglas pipe insulation shall be installed with joints butted firmly together. Jacket laps to be sealed with factory applied adhesive. Butt joints to be sealed with butt strips having factory applied adhesive. Valves and fittings shall be insulated using mitered sections of insulation, insulation cement, or premolded fitting insulation. The insulation applied to the valves and fittings shall be covered with the same type of covering as used on the pipe insulation.
- D. Valve bonnets, unions, strainers will be left free of insulation except for chilled water, refrigerant and domestic water piping systems, where they shall be covered. All insulation ends shall be tapered and sealed regardless of service. Where vapor barrier jackets are used on cold surfaces, insulation must be applied with vapor seal integrity maintained throughout the entire system.
- E. All insulated pipe extending through floor, countertops or wherever subject to moisture or cleaning equipment, shall have .016 inch thick aluminum jacket of sufficient length for protection.
- F. Faced duct wrap insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere insulation to metal with 4" stripes of insulation bonding adhesive at 8" O.C. Additionally secure insulation to the bottom of rectangular ductwork over 24" with mechanical fasteners at not more than 18" O.C. Circumferential and longitudinal joints shall have facing secured using staples applied 6" O.C. and taped with 4" wide foil reinforced draft tape. Tape all pin penetrations or punctures in facing.
- G. Ductwork, where indicated on drawings to be lined, shall not require exterior insulation.
- H. All insulation products shall be applied in accordance with manufacturer's written recommendations and this specification. The workmanship shall be first class and all joints shall be made tight.

END OF SECTION 15250

SECTION 15400 - PLUMBING

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.

1.2 WORK INCLUDES

Sanitary
Domestic Water Systems
Recirculating Hot Water System
Gas Piping System
Cleanouts and Drains
Trap Primers
Gas Valves
Fixtures
Special Equipment
Connections to equipment furnished under another contract.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Mechanical General Provisions: Division 15
- B. Basic Materials and Methods: Division 15
- C. Insulation: Division 15
- D. Controls and Instrumentation: Division 15

1.4 SUBMITTALS

- A. Furnish shop drawings for all plumbing fixtures, hot water heaters, pumps, meters, carriers and drains.
- B. Refer to Section 15010.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Cleanouts

1. Cleanouts in suspended sewers shall be cast iron body ferrules with brass screw plug.
2. Floor cleanouts inside building and outside in area "E" shall be Josam Series No. 56000 with cast iron body, brass internal plug, satin top brass rim and brass scoriated coverplate. Smith, Wade or Zurn acceptable.
3. Wall cleanouts inside building in occupied spaces shall be Josam Series No. 58710 with cast iron caulking ferrule, cast iron plug and stainless steel coverplate. Smith, Wade or Zurn acceptable.

B. Drains

1. Provide the following drains (except where otherwise specified on drawings). In general, Smith drains are specified. Smith, Wade or Zurn are acceptable.
2. Roof drains shall be JR Smith 1010 with CI mushroom dome strainer. Where side outlets are required for concealment of conductor runouts, drains shall be JR Smith 1020. Provide drains with roof sump receiver and under deck clamping rings.
3. Floor drains shall be as follows:
 - a. FD-1, FD: Smith 2005-a-nb C.I. with nickel bronze strainer.
 - b. FD-2: 2005-f37-nb C.I. with 7" anti flood round nickel bronze strainer. Install top of strainer flush with floor.
 - c. FD-3: Smith 3040, cast iron, 8½" top w/ ¾ strainer grate.
4. Drains in floors having membrane waterproofing shall be complete with a flashing clamp device to firmly secure membrane to drain body.

C. Trap Primers

1. Provide trap seal primer Precision Plumbing Products "Oregon" Model No. 1 for ALL floor drains. Connect to nearest cold water source.
2. Install in supply line to frequently used fixture with connection to drain trap.

D. General Requirements for Plumbing Fixtures and Trim

1. Except where otherwise indicated, the Plumbing Contractor shall furnish and install all plumbing fixtures indicated complete and ready for use. In general, American Standard (Amstan) fixtures are specified. Crane, Eljer or Kohler are acceptable. Stainless steel sinks shall be as manufactured by Just, Elkay or Moen.
2. All fixtures, except where otherwise specified, shall be constructed of vitreous china with all visible exposed surfaces glazed.

3. All fixture supports to be of type permitting adjustment to fit variations in construction. All grounds or special supports necessary for setting fixtures shall be provided before plastering or other finished construction work is begun. All fixtures shall be hung at normal height, ADA height or juvenile height.
4. Accessories, in general, are listed for each fixture. The Plumbing Contractor shall provide all stops, traps, escutcheons, connections, as necessary to complete installation of each fixture, whether such items are listed or not.
5. After all fixtures have been set and are ready for use, thoroughly clean all fixtures furnished, removing all stickers, rust stains and any other matter or discoloration, leaving every part in good condition. Adjust all flush valves and other fixture water supplies to give proper water flow.
6. Provide a flow control device in the supplies to each lavatory, sink and showerhead where they are not furnished integral with the supply fixture. Flow control to be Dole Model FMB (.5 GPM) for lavatories and sinks and Dole Model GS (2.0 GPM) for showerheads.
7. All finished exposed faucets, traps, connecting piping, stops, flush valves and other fixture trim shall be chromium-plated brass unless otherwise specified and shall be supported rigidly to fixtures and to walls with matching brackets. All fastenings shall be chromium-plated brass.
8. Shut-offs for urinal and water closet flush valves shall be integral part of the fixture or fitting. Shut-offs for all other fixtures shall be loose key, lock shield type. All fixture stops shall be angle or straight type adapted for each particular location and shall be located immediately adjacent to the fixtures. Use threaded adapters when used in conjunction with copper tube work.
9. Assemble lavatory and sink wastes and traps with slip joints and compression fitting on fixture side of trap. Sewer side connections shall be made with screwed joints. Slip joints on sewer side of traps are not acceptable.
10. Vacuum breakers shall be provided as a part of the fixture trim wherever there is a possibility of back-siphoning.
11. Check valves shall be provided in connection with all mixing fixtures, which normally might allow cross-circulation of hot and cold water when the fixture would not be in actual use.
12. Unless otherwise specified, support all wall mounted plumbing fixtures on Josam, Zurn, Wade or Smith concealed chair carriers with foot support.
 - a. Provide carriers for water closets with foot support and combined closet fitting and positioning frame. Provide chair carriers for urinals with double plates and foot supports. Provide carrier for lavatories with concealed arms unless otherwise specified.

- F. Fixture Schedule (See drawing P1.1 for fixture specifications.)
- G. Connections to Equipment Provided Under Another Contract
 - 1. Extend water, sanitary, storm, fire and gas lines to 5 to 10 feet outside building and connect to these services brought to building under a different contract. Include trenching and backfill.
 - 2. Designated sinks will be provided by the General Trades Contractor. The Plumbing Contractor shall install sink, faucet and all trim.
 - 3. Review kitchen equipment and specifications. The Plumbing Contractor shall provide the installation of various kitchen equipment.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Sanitary
 - 1. Location of soil, waste, vent and storm piping shall be as indicated on the drawings and meet the various building conditions. Do any work necessary to conceal piping or clear piping and ductwork of other trades.
 - 2. At least one soil or waste stack shall extend full size through the roof and shall be as direct as possible and free from sharp angles and turns.
 - 3. Slope branch soil and waste pipes at an incline of at least 1/4" per foot of run and main house drain and storm drain at 1/8" per foot unless noted otherwise. Make changes in direction of drainage piping by means of "Y" branches and 1/6, 1/8 or 1/16 bends except that sanitary "T's" and crosses may be used on vertical stacks. Make no unnecessary bends or offsets. Where changes in direction are unavoidable, make with bends of not more than 45 degrees.
 - 4. Provide cleanouts at or near the foot of each vertical waste, soil or storm sewer stack, at changes of direction greater than 45 degrees, and as indicated on drawings. Cleanouts on underground lines shall extend up flush with finished floor or grade. Provide cleanouts not over 50' o.c. along straight runs. Cleanouts shall be size of pipe to which it is installed up to 4" in diameter. Pipe over 4" in diameter shall have a 4" cleanout.
 - 5. Terminate vent pipes not less than 12" above finished roof. Make each vent terminal water-tight with the roof by using sheet lead (3 psf) with base not less than 12" in all directions from center of pipe and collar full height of pipe and turned down 2" inside of pipe.
 - 6. Lay all storm and sanitary sewers with full length of each section resting on a solid

bed. Lay pipe starting at upgrade with spigot end of pipe pointing in direction of flow.

7. All joints in cast iron bell and spigot pipe made with oakum and hot lead shall be filled flush at one pour and caulked until tight, shall not be less than 1" depth and shall extend up to not less than 1/8" below rim of hub.

B. Domestic Water Supply Systems

1. Provide water system as shown on drawings with hot and cold water being supplied and connected to all fixtures and equipment.
2. Pitch all water piping to drainage points. Provide hose end drain valves at such points.
3. Provide reduced pressure back flow preventers and install where indicated on drawings. Testing of device at time of installation is this Contractor's responsibility.
4. Provide air chambers on all cold and hot water lines at each group of fixtures and at isolated individual fixtures. Air chambers shall be full size and in the following lengths:

| | |
|----------------------------|----------|
| 1/2" and 3/4" pipe | 12" long |
| 1", 1-1/4" and 1-1/2" pipe | 2' long |
| 2" and larger pipe | 2' long |
5. Provide water hammer arrestors in water lines on the inlet side all quick closing valves. Size and installation procedure as recommended by manufacturer.
6. Provide unions at all equipment valves, strainers, etc., to facilitate removal for repair or replacement without disturbing adjacent piping.
7. Nipples between copper pipe and fixture supply fittings shall be brass pipe not galvanized steel pipe.

C. Recirculating Hot Water System

1. The terminal point of the hot water mains shall be connected as indicated on the drawings to recirculating hot water branches and mains. The recirculating branches and mains shall be vented through fixtures and installed so that no air binding will occur. Each branch return is to be valved to permit balancing of the system.
2. Circulating pump shall be an in-line bronze fitted or stainless steel circulator. Armstrong, Pacific, Taco or Grundfos are acceptable.

D. Gas Piping System

1. Provide insulated Dresser coupling where gas piping is connected to meters. Protect underground gas piping with Hill-Hubbell wrapping or "Extru-Coat" with

joints protected with "Scotch" wrapping, but not less than as required by the serving utility for their piping. Provide anodic protection on underground piping conforming to utility company standards.

2. Connect to all building equipment requiring gas. Install drip leg and shut-off cock at each connection.

E. Gas Valves

1. Gas valves above ground shall be A.G.A. approved square head plug type with lever handle and adapted for gas service.

END OF SECTION 15400

SECTION 15500 - FIRE PROTECTION

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specification which affect work under this Division.

1.2 WORK INCLUDED

- A. The entire building is to be equipped with an automatic fire suppression (sprinkler) system.
 - 1. Pipe and fittings
 - 2. Valves
 - 3. Sprinklers and standpipes
 - 4. Flow switches
 - 5. Tamper switches
 - 6. Accessories

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. General Provisions: Division 15
- B. Basic Materials and Methods: Division 15

1.4 PERMITS

- A. Permits required for fire protection installation shall be obtained and paid for by the Fire Protection Contractor.

1.5 GUARANTEE

- A. Guarantee period shall begin on the date the system is placed in beneficial service to the Owner and continue for one (1) year.

1.6 INSPECTION SERVICE

- A. After completion of the fire protection installation and at the start of the guarantee year, the Fire Protection Contractor shall execute the National Automatic Sprinkler and Fire Control Association, Inc. standard form of "inspection agreement;" without charge to the Owner,

calling for four (4) inspections of the sprinkler system during the guarantee year. Provide Owner and Architect with a copy of this document.

- B. During the guarantee year, inspections shall be made as per the inspection agreement, plus the following maintenance to be performed during the course of the fourth inspection:
 - 1. Operation of all control valves.
 - 2. Lubrication of operating stems of all interior control valves.
 - 3. Operation of water motor gong and/or electric alarms.
 - 4. Cleaning of alarm valves.
 - 5. Lubrication of fire department hose connection inlets.
 - 6. Trip testing of dry pipe valves and quick opening devices.

1.7 DRAWING INTERPRETATION

- A. The drawings are essentially diagrammatic to the extent that zones and construction types are indicated for coverage design only.
- B. Attention is called to the limited space available for the installation of mechanical services. It is essential for the coordination of all trades that this Contractor be responsible for confirming the location and elevations of his piping and equipment at the job site to avoid encroaching upon the space needed and allocated for another trade.
- C. Drawings are not intended to be scaled for roughing in measurement or to serve as shop drawings, installation drawings or sleeve drawings. "Working Plans" for these purposes shall be prepared by the Contractor.

1.8 SUBMITTALS

- A. Refer to Section 15010.
- B. Submit shop drawings for all required materials and equipment. Furnish 1/4" = 1'- 0" scale drawings for sprinkler system.
- C. Sprinkler and standpipe system shop drawings shall include all applicable data as required by NFPA 13, 1981 para. 1-9 "Working Plans".

1.9 TESTS

- A. The appropriate tests and flushing procedures shall be conducted as the installation progresses, as stipulated by the applicable regulations. Contractor shall provide all

necessary labor and equipment for such tests.

- B. All tests shall be witnessed by all interested agencies unless specifically waived by the agency in writing. Adequate advance notification shall be given in writing to all such parties.
- C. All pressure testing and flushing shall be in accordance with NFPA-13 requirements. Fire pump shall be tested in accordance with NFPA-20 requirements.
- D. Make hydrostatic test on sprinkler and standpipe system, 200 psi for 2 hours.
- E. All defects made evident by the tests shall be properly repaired by the Contractor. Leaks shall be repaired only by means of tightening or replacing the fitting and not resorting to any caulking method.
- F. After the completion of testing and adjustments, Contractor shall furnish three (3) copies each of signed certificates of approval or acceptance of all parts of the systems from all authorities having jurisdiction.
- G. Upon completion of the entire Fire Protection System installation, an operating test shall be made in the presence of the purchaser, local fire officials, pump and controller representatives, and representative of the authority having jurisdiction.

1.10 APPROVALS

- A. Submit shop drawings and hydraulic calculations to and obtain approval from: State Department of Industrial Relations and local government agencies. After the above and prior to construction, the documents shall be submitted to the Architect for review.
- B. All devices and materials pertaining to all Fire Protection Work shall bear the U.L. stamp of approval.

1.11 CERTIFICATION

- A. Contractor shall provide Owner with three (3) copies each of the following:
 - 1. Flushing certificate
 - 2. Hydrostatic pressure test certificate
 - 3. Record drawings.

1.12 TEMPORARY FIRE PROTECTION AND PRECAUTIONS

- A. During the construction period, provide temporary fire extinguishment facilities to include portable extinguishers, water barrels and fire pails and small hose streams as required.

1.13 OPERATING AND MAINTENANCE MANUALS

- A. The Contractor shall provide the Owner with three (3) complete sets of printed instructions and his drawings covering the proper operation and maintenance of all equipment furnished under these specifications. Manuals shall include but not be limited to the following:
1. Mechanical sequence of operation
 2. Any necessary diagrams
 3. Recommended periodic testing procedure
 4. Recommended preventative and scheduled maintenance procedures.
 5. Recommended spare parts list for one (1) year maintenance program.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Pipe and Fittings
1. Pipe and tube shall be welded or seamless steel or copper as scheduled in Table 3-1.1.1 and in accordance with paragraph 3.1 of NFPA-13.
 2. Piping joined with threaded fittings or by couplings with pipe having cut grooves shall have a minimum of schedule 40 wall thickness.
 3. Groove joining shall be done by an approved combination of couplings, gaskets and grooves. Grooves on pipe shall be dimensionally compatible with fittings.
 4. Pipe and tube used in sprinkler systems shall be designed to withstand a working pressure of not less than 175 P.S.I.
- B. Valves
1. Gate valves in the fire and standpipe system shall be U.L. approved O.S. & Y. gate valves or butterfly valves, 175 lbs. WWP.
 2. Check valves in fire lines and sprinkler lines shall be U.L. iron body bronze mounted checks, flanged ends, 175 lbs. WWP.
 3. Valves ahead of flow switches shall be suitable for tamper switches.
- C. Sprinkler Systems
1. Install U.L. or F.M. approved sprinklers as indicated on drawings. Sprinkler heads shall be as manufactured by Central Sprinkler Corp. Grinnell, Star or Viking.

2. Provide upright spray type, pendent type, sidewall type or concealed ceiling type as indicated on plans:

| | |
|-------------|--|
| Upright: | Central Model "A" Factory bronze |
| Flush Type: | Central Model "76A" White ceiling plate w/matching escutcheon |
| Sidewall: | Central Model "H" Polished chrome w/matching escutcheon - Standard or extended coverage. |

3. The temperature rating of the heads shall be selected to compensate for the maximum ambient temperature of space protected.
4. Provide a stock of spare heads of each type and rating of not less than the quantities required by NFPA-13. Provide a metal cabinet appropriately labeled for head storage.
5. Automatic sprinkler piping systems shall be hydraulically designed by the Contractor.
6. The sprinkler system shall be hydraulically balanced to provide the required minimum density over any area including the most hydraulically remote area.
7. Calculations shall include the sprinkler system demand and hose stream requirements.
8. The hydraulic calculations shall be based on the Hazen-Williams Formula with a "C" factor of 140 for underground piping and 120 for overhead piping.
9. A riser name plate shall be permanently affixed to each calculated system riser, providing hydraulic data in accordance with N.F.P.A. requirements.

D. Tamper Switches

1. Furnish and install Potter Electric Signal Co., Notifier or equal 115 V gate valve switch. Provide N.O. and N.C. contacts.
2. Tamper switches shall be installed as per manufacturers recommendations.
3. Electrical Contractor to wire.

E. Flow Switches

1. Furnish and install Autocall waterflow indicators, Viking or Notifier where shown on Drawings. Size as required for piping served. Provide N.O. and N.C. contacts and incorporate a pneumatic adjustable retard.
2. Flow switches to be installed as per manufacturer's recommendations.
3. Electrical Contractor to wire.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall furnish all labor, necessary construction equipment and materials necessary for the complete installation of the fire protection system as shown on the plans. All work shall be in strict compliance with all governing state and local codes, requirements, in full conformity with the best current trade practices and subject to approval of the Architect or his Representative.
- B. All work details not covered in these Specifications shall be governed by the requirements of the latest edition of N.F.P.A. No. 13.
- C. Sprinkler piping shall be installed to provide a minimum of 7 ft. 6 in. from finished floor to pendent sprinkler deflector or bottom of pipe for upright heads.
- D. Piping shall be screwed, welded, flanged or joined with mechanical fittings. Acceptable mechanical fittings include Aeroquip or Victaulic as listed by Factory Mutual. All welding shall be performed in conformance with N.F.P.A. No. 13.
- E. Insulate connections between pipe, fittings and hangers of dissimilar metal against direct contact. Use dielectric insulating flanges and unions.
- F. Support all sprinkler piping, standpipe risers, etc., as specified in N.F.P.A. No. 13.
- G. Flushing Connections - 4" long nipple and cap shall be provided at ends of all crossmains.
- H. Reducers shall be eccentric and installed in piping so that piping can be drained.
- I. All drain lines including riser drain, alarm drain, Inspector's test drain, low points, etc. shall terminate with turned down ells and shall be so located that discharged water will not interfere with normal conduct of business in building. Concrete splashguards shall be provided at grade level beneath all outside drains to minimize soil erosion.
- J. Provide Inspector's test drain at furthest point of each riser system. Provide sleeves for all pipes passing through firewalls and partitions. Set sleeves before floors and walls are poured. Pack sleeves with fireproofing material to the firewall equivalent.

- K. Copper solder joints shall have pipe or tubing ends reamed to full inside diameter after cutting. Exterior of joint must be smooth. Clean with steel wool.
- L. Make screwed joints with pipe compound applied to male threads only. All cut ends of the pipe shall be carefully reamed to full size. U.L. approved flexible couplings are permitted on all feed mains and standpipe risers.
- M. Valves shall not be installed with stems in less than a horizontal position. All fire valves shall be monitored with tamper switches.
- N. All piping and equipment shall be furnished and installed in a manner and in locations avoiding all obstructions and maintaining required head room clearances. Field check before start of any installation.
- O. Locations of all sprinkler heads and piping shall be coordinated with ceiling grid pattern, lighting fixtures, columns, HVAC diffusers, all mechanical equipment and other possible obstructions.

END OF SECTION 15500

SECTION 15800 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 GENERAL

- A. The provisions of the Instructions to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda and Division I are a part of this Specification. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.

1.2 WORK INCLUDES

Dampers and deflectors
Grilles and diffusers
Exterior louvers
Access doors
Acoustic duct lining
Ductwork
Flues
Fans
Variable Air Volume (VAV) boxes
Unit heaters
Filters

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Mechanical General Provisions: Division 15
- B. Basic Materials and Methods: Division 15
- C. Insulation: Division 15
- D. Heat Transfer: Division 15
- E. Controls and Instrumentation: Division 15

1.4 SUBMITTALS

- A. Refer to Section 15010.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Low Pressure Ductwork

1. All ductwork shall be constructed of galvanized steel except in Natatorium and Locker Rooms where it shall be aluminum. Exposed ductwork in architecturally finished spaces shall be fabricated from "Paint Grip" galvanized steel or similar mill surface etch treatment or properly cleaned, primed and painted with a guarantee by paint manufacturer/contractor of no bleeding and peeling.

B. Flexible Ducts

1. Omniair Model 1300 - Low pressure non-insulated for exhaust ducts and supply air ducts in conditioned spaces up to 6" static pressure.
2. All flexible tubing shall be tested and classified by Underwriters Laboratories, Inc. as Class I Air Duct and labeled in accordance with Underwriters Laboratories, Inc. Standards for Air Ducts, UL 181. The flame spread rating shall be 25 or less and the smoke developed rating shall not exceed 50.
3. Install flexible tubing fully extended, free of sags and kinks. Maximum length of tubing shall be 5'-0". Flexible tubing shall be connected to supply air ducts with flared spin-collar fitting. Diffusers in exposed areas shall be hard piped (no flex)
4. Flexible tubing types refer to Omniair. Equivalent by Clevaflex or Flexmaster Company are acceptable.

C. Design Requirements for Low Pressure Ductwork Upstream of VAV Terminals

1. Construct as a low pressure system; however, seal all ducts to be airtight. The construction of the ductwork shall be as described in the SMACNA low-pressure manual with the following items to be added from the High Velocity Standards.
 - a. Longitudinal seams shall be as Fig. 3-16 or Fig. 3-17, page 41 (no bottom punch snap lock seams).
 - b. All joints are acceptable as in High Velocity Manual. No tie rods required as shown, use reinforcing schedule as in Low Pressure Manual.
 - c. All seams and joints are to be sealed as shown in the High Velocity Manual (Page 23 thru 41).
 - d. Wherever a metal screw penetrates the duct system, it shall tighten into a seat of sealant. See Fig. 3-18, page 41 in High Velocity Manual.
 - e. Hangers can be as in Low Velocity Duct Manual. Trapeze type preferable.
2. Main and branch duct takeoffs shall be fabricated with reference to Plate No. 26, page 61 of the Low Pressure Manual:
 - a. Takeoffs from the main trunk duct to branch ducts are to be as shown in Fig. C-1 and C-2.
 - b. Final round runouts from main or branch ducts to VAV units are acceptable as shown in Fig. A.
3. The system is to be tested and all leaks resealed with a compound similar to EC-

800.

2.2 EQUIPMENT

A. Dampers and Deflectors

1. Provide all manual dampers and deflectors indicated on drawings or where necessary to properly distribute and balance air. Provide damper in each supply duct leaving duct main and in each branch serving individual supply, return and exhaust outlets and where otherwise indicated.
2. Dampers shall be fabricated with blades no larger than 8" wide x 48" long. Dampers over 48" in length shall have intermediate support and bearings.
3. Provide all manual dampers with Young Regulator Company, Ventlock, or Dura-Dyne operators. Use Young Regulator No. 443-B operators for balancing dampers. Where dampers are concealed above suspended ceilings, other than removable ceilings or behind walls, provide access doors or provide Young Regulator Company adjustable recessed damper operators with flush prime coated covers and extend regulator number 896, 912, 914, or 927 as applicable.
4. Install additional dampers where required by the Air Balance Contractor to properly adjust the system air volumes. Arrow, Ruskin and American Warming & Ventilating acceptable.

B. Grilles and Diffusers

1. See drawings for all registers and accessory specifications, locations and cfm.
2. In general, Titus registers are specified. Equals as manufactured by Krueger, Price or Nailor-Hart are acceptable.
3. All registers to have a factory-applied off-white finish unless otherwise noted on plans.
4. Refer to architectural reflected ceiling plan for exact location of ceiling registers.

C. Exterior Louvers

1. Provide weather resistant exterior wall louvers, size as indicted on drawings.
2. Louvers shall be Arrow, Model 465-35, 4" deep, weather resistant, extruded aluminum, with 1/2" square mesh aluminum screen on interior face.
3. Equivalent louvers by Aiolite, American Warming or Ruskin are acceptable.
4. Factory duranodic finish. Color selected by Architect.

5. Provide louvers where indicated on plans and at all exterior wall penetrations of intake and exhaust ducts unless noted otherwise.

D. Flexible Duct Connections

1. Provide flexible connections with 1" slack between ducts and fans where shown on drawings. Flexible material shall be "Vent-glas" as manufactured by Iden Associates.

E. Access Doors and Hardware

1. Furnish access doors for each automatic damper, fire damper, smoke damper, coil, fan, filter bank, suction chamber, inlet side of coil, hot and cold plenum, and where indicated.
2. Main door hardware shall include three hinges with latches operable from either side. All other access doors shall include two hinges and latches. Open doors outward on suction side, inward on pressure side.
3. Provide access doors with latches, hinges and felt gaskets as manufactured by Young Regulator Co., Ventlock or Dura-Dyne.

F. Acoustic Duct Lining

1. Where indicated, line ductwork with 1" thick Owens-Corning "AeroFlex Duct Liner" type 300. Coating shall be U.L. rated for flame spread less than 25 and smoke developed less than 50. Lining to be installed with stick-klips and adhesive per manufacturer's instructions.
2. Line supply and return air ductwork run outdoors as specified above except insulation thickness to be 2".
3. Dimensions shown on drawings are net free area. Increase duct to accommodate duct lining.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide all sheet metal work as shown on the drawings in accordance with the latest edition of the ASHRAE guide and data book, SMACNA standards and this specification, the most demanding of which shall be the minimum standard.
- B. Install ductwork and flues indicated on drawings making all necessary changes in cross sections and offsets, whether or not specifically indicated.
- C. All changes in cross section shall be made without reducing the design area of the duct.

- D. Cap all open ends of ductwork until connected to grilles, diffusers, equipment to prevent entrance of debris, dust, etc.
- E. Make changes in direction of ductwork, unless otherwise specified with square elbows and double thickness turning vanes; full radius elbows having inside radius equal to width of duct measured in plane of turn; or one-third radius elbows with inside radius equal to one-third duct width and a single vane with radius of two-thirds duct width.
- F. No pipe or other obstructions shall pass through air ducts.
- G. Install all ducts run below ceilings so as to maintain maximum headroom in all rooms and corridors.
- H. Ducts passing through exterior walls shall be provided with weatherproof flashings. Ducts passing through roof shall be provided with roof curb and counter flashing. Where ducts pass exposed through interior building walls, provide a sheet metal collar to conceal the gap between the wall opening and the duct.
- I. Ducts shall not be hung from other ducts, pipe, or conduit.
- J. Set all automatic air control dampers furnished by the Control Contractor.
- K. Duct dimensions are gross except for lined ducts where dimensions are for net free area.
- L. All joints and seams in ducts shall be airtight. Poorly made joints, splits, visible holes at corners, etc., shall be reworked or new pieces of ductwork installed. Where excessive pulsating of ductwork or plenum housing is found, additional stiffeners shall be added. Any cracking in the coating around seams or joints, or in any other part of the formed ducts that is apparent upon inspection, shall be sufficient to warrant rejection.
- M. Sheet metal exposed to view through air distribution devices in finished areas of the building shall be coated with primer and a flat black finish coat.

END OF SECTION 15800

SECTION 15900 - CONTROLS AND INSTRUMENTATION

PART 1 - GENERAL

1.1 WORK INCLUDES

Central processing unit
Software
Control Equipment
Unitary Control Units
Automatic dampers
Damper actuators
Sequence of Operations
Point lists as described under each piece of equipment/system

1.2 ITEMS FURNISHED BUT NOT INSTALLED

A. SECTION 15500 - Hydronic Piping:

1. Flow switches
2. Temperature sensor wells
3. Gauge taps
4. Flow meters.

B. Section 15700 - Ductwork Accessories:

1. Installation of automatic dampers
2. Shafts and brackets and extend the required number of shafts through the ducts for externally mounted damper motors.

C. Section 16000 - Equipment Wiring Systems:

1. Installation and connection of all power wiring. Power wiring shall be defined as follows:
 - a. Wiring of power feeds through all disconnect starters and variable speed controllers to electric motors.
 - b. 120 VAC wiring to DDC terminal units without fan motors or heaters as scheduled.
 - c. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by the Temperature Control Contractor.

1.3 GENERAL PROVISIONS

- A. The General Provisions of the Contract, including the General Conditions and supplementary General Conditions, apply to the work specified in this section.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 15 - General Provisions
- B. Division 16 - General Provisions
- C. Division 15 - Basic Materials and Methods
- D. Division 15 - Plumbing
- E. Division 15 - Heat Transfer
- F. Division 15 - Air Distribution

1.5 GENERAL INSTRUCTIONS

- A. The BAS/ATC Contractor as specified herein shall provide the BAS/ATC systems in their entirety. The BAS/ATC Contractor shall base this Bid on the system as specified, the sequence of operations and the points list.
- B. The proposal shall be based on a completely electronic system, including valve and damper actuators, and a full DDC/VAV system, wherein all equipment is centrally controlled by the BAS/ATC system.
- C. The proposed building and current scope of work include building core and shell services for future tenant build out. Provide a BAS/ATC system to be located at a location to be determined by the tenant build out plan. System shall meet the needs and requirements of the building shell and also the needs/requirements of the future tenant build out.
 - 1. BAS/ATC system shall be capable of monitoring/controlling a minimum of 40 FPVAV terminals with electric reheat and 60 VAV terminals with electric reheat.
 - 2. BAS/ATC system shall be capable of monitoring/controlling a minimum of 4 exhaust fans.
 - 3. BAS/ATC system shall be capable of monitoring/controlling a minimum of four additional supply/exhaust fans and or return air stations.
 - 4. BAS/ATC system shall be capable of monitoring/controlling (1) additional RTU.

1.6 SCOPE

- A. The Temperature Control systems shall be supplied and installed completely under the Temperature Control Contract. Control components shall be mounted and wired by the Temperature Control Contractor. The Temperature Control Contractor is a subcontractor to the Mechanical Contractor.
- B. The Temperature Control Contractor shall provide the engineering, installation, calibration, software programming and checkout necessary for complete and fully operational Temperature Control system, as specified hereafter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Trane Tracer, Carrier CCN, Honeywell, and Johnson Controls , and Seimens are approved.

2.2 SUBMITTALS

- A. Refer to Section 15010.
- B. The following shall be submitted for approval:
 - 1. Sequence of operation;
 - 2. Valve and damper schedules showing size;
 - 3. Hardware and software control components.
- C. Deviations in details from the specified sequence of control shall be clearly noted on the sequence of control portion of the submittal.

2.3 GENERAL

- A. The building automation system shall include but not be limited to the following components:
 - 1. The Operator Interface shall consist of hardware and software that allows full user monitoring and adjustment of system parameters.
 - 2. System Application Controllers shall manage the Energy and Building Management capabilities of the automation system as well as facilitate remote communications and central monitoring.
 - 3. Application Specific Controllers shall provide distributed pre-engineered control specific to the mechanical equipment specified.
 - 4. Custom Application Controllers with distributed custom programming capability shall provide control for non-standard control sequences.
 - 5. The Data Communications capability shall allow data to be shared between the various controllers in the architecture.
 - 6. The system software shall include system software for the global application functions, application software for distributed controllers, and operator interface software.
 - 7. End devices such as sensors, actuators, dampers, valves and relays.
 - 8. The failure of any single component shall not interrupt the control strategies of other operational devices. System expansion shall be through the addition of end devices, controllers, and other devices described in this specification.

2.4 OPERATOR INTERFACE

- A. An interface shall be provided to allow the building operator to view and acknowledge alarms, access/edit system database information, view system displays and reports, and customize the system as described in this specification. The PC interface shall also allow the operator to communicate with remote systems over voice grade phone lines. The user shall be able to define a minimum of 99-180 character messages for automatic printing in the event of system alarm and/or run time and maintenance event. The PC interface shall be capable of displaying dynamic real-time point data on color graphic displays.
- B. PC Station:
1. The EMS computer shall be located where indicted on drawings and shall include the following as a minimum:
 - a. Personal Computer – Pentium IV 2.6 GHz or higher Intel®-based processor with 1MB cache RAM
 - b. 1 GB of RAM
 - c. 100 GB hard drive
 - d. 17" 1024 x 768 SVGA LCD monitor.
 - e. 1024 x 768 video graphics adapter card with 128 MB video RAM
 - f. CD ROM
 - g. Internal Modem card, NIC.
 - h. One parallel, serial, and USB mouse port with all cables for system operation
 - i. USB Mouse and USB keypad
 - j. Multi-tasking software e.g., Windows XP Professional
 - k. Report & Alarm Printer.
- C. Operating Software:
1. Multi-tasking, single user operating software shall be provided for the operator's station, as shown in the contract documents. The vendor shall provide all required software, including the database. The PC shall be capable of running XP Professional operating system.
- D. Host Computer Software
1. Energy management report generation.
 2. Trend logs setup and storage.
 3. Alarm generation, status, and prioritization.
 4. User interface with English language applications.
 5. Dynamic graphics applications.
- E. Work Station Software COLOR GRAPHICS
1. Dynamic/interactive color graphics software shall allow the display of dynamic real-time point data from panels on operator-created color graphic displays. Displays shall be created with the use of a mouse, digitizer, or joystick, and be capable of displaying up to 32-bit color quality.

2. The package shall be capable of presenting dynamic information in the form of descriptors, values, and/or symbols. Dynamic points shall be located on the graphic by using either a pointing device or keyboard.
3. The graphics interface must provide the ability to manually override points.
4. Notification of alarms from panels must be provided on the graphic display while the system is in the graphics mode.

2.5 SYSTEM APPLICATION CONTROLLERS

- A. The Building Automation System shall be composed of one or more independent, stand-alone; microprocessor based System Application Controllers to manage the global strategies described in the Application software section.
- B. The operating system of the System Application Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms. Data shall automatically be shared between System Application Controllers when they are networked together.
- C. The database and custom programming routines of remote System Application Controllers shall be editable from a single operator station.
- D. The System Application Controllers shall have the capability of being remotely monitored over telephone modem. Additional capabilities shall include automatically dialing out alarms, gathering alarms, reports and logs, programming and downloading databases.

2.6 APPLICATION SPECIFIC CONTROLLERS

- A. Application Specific Controllers shall be standalone, microprocessor based Direct Digital Controllers with sufficient memory to handle its operating system, database and programming requirements. Where factory mounting is not possible, the controllers shall be factory programmed and tested prior to shipment to the jobsite. The controllers shall be clearly labeled as to controller type, where it is to be installed and software addresses (if applicable). The controller shall be fully tested upon installation to ensure that it is properly matched to the equipment it is controlling. The controller shall communicate with other devices on the communication network and be fully integrated with the other system components.
- B. Where specified in the sequence of operations or points list, the controller shall have a display and keypad for local interface with mechanical equipment. A keypad and display shall be mounted on the unit it is controlling. A portable service tool is acceptable by must be permanently mounted at the location specified for the keypad and display. No exceptions will be permitted.

2.7 SYSTEM APPLICATION CONTROLLER SOFTWARE

- A. SYSTEM SECURITY. User access shall be secured using individual security passwords for a minimum of eight users. Passwords shall have at least three levels of user access with data entry restrictions being assignable by password.
- B. ALARMS. The Building Automation System shall provide audio, visual, contact closure and remote telephone annunciation for:
 - Remote equipment failure
 - Equipment run time
 - Number of start/stops
 - Program failure
 - Card failure
 - Sensor failure

When an alarm state is detected, the alarm shall automatically be stored and the user notified by printing the alarm message sounding an audible tone, and flashing an alarm message on the CRT.
- C. REMOTE COMMUNICATIONS. A web based communications utility shall allow standalone System Application Controllers to communicate with remote operator stations over voice grade phone lines. Remote communications shall be broadband capable but not broadband required.
- D. Controllers shall have the ability to automatically report to operator stations to report alarms, and upload historical data and reports. In the event that the controller is unable to connect with the remote station, it shall continue to attempt communication on a predetermined interval until communication is successful. The capability shall exist to automatically switch to a backup operator in the event communications is unsuccessful with the first operator.

2.8 ENERGY MANAGEMENT SOFTWARE

- A. The following Energy Management capabilities shall be furnished standard as part of the building Automation System.
- B. SCHEDULING. The scheduling program shall have a minimum of 32 named master schedules. Each master schedule shall have a minimum of eight day schedules (seven plus holidays).
- C. OPTIMUM START/STOP. An optimum start/stop program shall determine the required equipment start/stop timing by applying inside/outside temperature information to the user's time of day schedule.
- D. DEMAND LIMITING. The demand-limiting program shall be based on a predictive sliding window algorithm. The program shall be self-adjusting and shall control a minimum of two independent demand limiting applications.

2.9 BUILDING MANAGEMENT SOFTWARE

- A. The following Building Management capabilities shall be furnished as part of the Building Automation System.
- B. TIMED OVERRIDE. A timed override program shall be provided to enable the building operator to set up devices or groups of device to be temporarily turned on for defined period of time based on binary inputs, analog inputs, or CRT inputs.
- C. DIRECT DIGITAL CONTROL. The Direct Digital Control program shall allow modulating control of remote devices based on sensed data. Standard control strategies shall include proportional, proportional plus integral, and proportional plus integral plus derivative control.
- D. CUSTOM PROGRAMMING LANGUAGE. A custom control language capability shall be provided to allow the operator to create real time, equation based, and customer control routines. Equation operations shall include math functions such as addition, subtraction, multiplication, division, square root, minimum, maximum and average. Logical functions such as greater than, less than, equal to, not equal to, less than or equal to, greater than or equal to, variable timing and delays shall also be allowed.
- E. REPORTS AND LOGS. The system shall include the capability to store, review and print the following reports and logs. In addition, if a PC interface is specified, these reports shall be saved to diskette as an ASCII file for use by other owner furnished software packages.
- F. Custom Report Capability - The building operator shall be provided with a simple method of creating customer reports.
- G. ANTI-RECYCLE TIMER PROTECTION. A software program shall be provided to allow each individual piece of HVAC equipment to be individually programmable with "minimum on" and "minimum off" timers to protect HVAC equipment from rapid cycling due to system or operator error.
- H. DIAGNOSTICS. A system self-test shall be provided. On self-test initiation, panels failing to respond shall be identified on the printer.
- I. CUSTOM PROGRAMMING REQUIREMENTS. A user-friendly custom DDC programming utility shall be provided to allow the building operator to tailor the system to meet individual needs and respond to changing building requirements. The building operator shall be able to create custom DDC routines using analog and binary point values, alarm status, constants and shared variables to perform calculations. The results of these calculations shall be used to perform analog control, binary control, DDC loop enable/disable, and other control functions. The building operator shall be able to download these routines to the System or Custom Application controllers either via modem, direct connect, or through a Portable Operator Interface.

2.10 INPUT/OUTPUT INTERFACE

- A. Hardwired inputs and outputs may tie into the system through System Application, Custom Application, or Application Specific Controllers. Slave devices are also acceptable. Any critical points requiring immediate reaction shall be tied directly into the controller hosting the control software algorithm for the critical function.

- B. All status points shown on the point list shall be positive proof differential pressure or current sensing binary switches. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 or 10 VDC or a 4 to 20 milliampere signal as required to provide proper control of the output device.

2.11 AUXILIARY CONTROL DEVICES

A. Dampers

1. The Building Automation System supplier shall provide all automatic control dampers not specified to be supplied integral to the HVAC equipment.
2. Dampers shall be low leakage or high velocity low leakage as specified in the sequence of operations. All proportional dampers shall be opposed blade type. Two position dampers may be opposed or parallel blade type.
3. Damper frames and blades shall be galvanized steel and a minimum of 16 gauge. Blade width shall not exceed 8 inches. Dampers and seals shall be suitable for temperature ranges of -50 to 250 degrees F.
4. Standard low leakage dampers shall be provided to conserve energy. Dampers shall be equipped with neoprene edge seals and compressible metal jamb seals. Leakage shall not exceed 10 CFM/Sq.Ft. at 4" W.G. differential.
5. Standard Low Leakage dampers shall be Ruskin, Model CD45 or equal.
6. High Velocity Low Leakage Dampers: Where specifically called out in the specification, low leakage dampers shall be furnished. Field replaceable edge and end seals will be installed along the top, bottom, and side of the frame and each blade. Seals and bearings shall be suitable for temperature ranges from -40 to 200 degrees F. Leakage shall not exceed 6 CFM/Sq. Ft. at 4" W.G. differential.
7. High Velocity Low Leakage dampers shall be Ruskin, Model CD60 or equal.

B. Damper Actuators

1. Damper actuators shall be electric or electronic type and shall be properly sized so as to stroke dampers smoothly and completely throughout their range. Actuators shall provide two-position or modulating control as specified by the equipment control sequence of operation. Modulating actuators shall provide linear response to the applied control signal that may be a 0-10 VDC, 4 - 20 ma current or tri-state floating-point type. For power-failure/safety applications when specified in the sequence of operation, a mechanical, spring return mechanism shall be used.

C. Temperature Sensors

1. Temperature sensors shall be Resistance Temperature Detector (RTD) or Thermistor as dictated by the requirements of this specification.

2. Duct sensors shall be rigid or averaging as specified in the sequence of operations. Averaging sensors shall be a minimum of 5 feet in length.
3. Immersion sensors shall be provided with a separable stainless steel well.
4. Space sensors shall be equipped with setpoint adjustment and/or override switch as specified on the plans or in the sequence of operations.
5. Accuracies shall be +/- 1 degree F for standard applications. Where high accuracy is required, accuracies shall be +/- .2 degrees F.

D. Humidity Sensors

1. Humidity sensors shall be capacitance or bulk polymer resistance type.
2. Duct and room sensors shall have a sensing range of 20 to 80% with accuracy of +/- 5% R.H. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20 to 95% R.H. It shall be suitable for ambient conditions of -40 to 170 degrees F.

E. High Limit Thermostats

1. High limit thermostats shall be manual reset type set at 120 degrees F.

F. Low Limit Thermostats

1. Safety low limit thermostats shall be vapor pressure type with a 20-foot minimum element. Element shall respond to the lowest temperature sensed by any one foot section.
2. Low limit shall be manual reset only.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. All electrical work performed in the installation of the BAS/ATC system as described in this specification shall be per the National Electrical Code (NEC) and per applicable state and local codes. Where exposed, EMT conduit shall be run parallel to building lines properly supported and sized at a maximum of 40% fill.
- B. In no cases shall field installed conduit smaller than 1/2" trade size be allowed. Where conductors are concealed such as tenant spaces and above drop ceilings, cable rated for use in return air plenums shall be used.

3.2 OWNER TRAINING

- A. The BAS/ATC contractor shall provide three copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the temperature control and Building Automation System supplied. This contractor shall instruct the owner's designated representatives in these procedures during the startup and test period. The duration of the instruction period shall be no less than 24 hours, during normal working hours.

3.3 SEQUENCE OF CONTROL

- A. All BAS/ATC devices and installation shall be warranted to be free from defects in workmanship and material for a period of one year from the date of job acceptance by the owner. Any equipment, software or labor found to be defective during this period shall be repaired or replaced without expense to the owner. Factory authorized warranty service shall be available.
- C. HVAC (VAV System)
1. This unit shall be controlled by a stand-alone microprocessor based controller with resident control logic. The BAS shall perform the following rooftop control strategies, provide the points listed on the points list and provide the specified monitoring and diagnostics.
 - a. Occupied Mode - All unit functions will be enabled for normal cooling operation. Unit defaults to thermostat mode when communication with BAS is lost.
 - b. Normal Operation - When in occupied mode as described above, the dedicated unit control shall operate stages of heating and cooling to maintain space temperature setpoint. Setpoints shall be reset through BAS by the operator.
 2. Starting Mode - When the unit is turned on by the BAS for optimal start, heating or cooling is provided as required. The outside air dampers, remain closed, in heating mode, until occupied time.
 3. Coastdown Mode - When the unit is turned "OFF" by the BAS for optimal stop, the supply fan remains "ON", the outside air damper remains open for ventilation, and a setpoint offset is initiated to limit heating and cooling. Space comfort is protected by the user-defined setpoint offset.
 4. Night Setback Temperature Control - When the BAS selects unoccupied mode, the unit shall be controlled to maintain user defined unoccupied heating and cooling setpoints. The outdoor air damper remains closed during heating night setback operation.
 5. Nighttime Free-Cool Purge Mode - An "economizer only" cooling cycle shall be provided during unoccupied hours when outdoor air conditions are suitable and the zone requires cooling.
 6. Low Ambient Compressor Lockout - Compressor operation shall be disabled below a user defined outdoor air temperature.

7. Timed Override - When a timed override is initiated by the user, the unit will return to its user defined normal occupied mode for the user-determined period of time.
8. Smoke Shutdown - The unit will shut down in response to a unit-mounted smoke detector indicating the presence of smoke.
9. Manual Setting of Heat or Cool Mode - BAS Operator shall be able to select the following unit operating modes:
 - a. Heating
 - b. Cooling
10. Supply Air Pressure Control-A supply air pressure controller shall maintain an adjustable setpoint. The variable frequency drives shall modulate to maintain this setpoint based on the static pressure sensor located in the supply air discharge of the rooftop unit. Static pressure control can be through the DDC controller or stand-alone. Initially, the static pressure shall maintain 1.5" w.c. at a point 75% along the most remote developed length. See "ASC Control Strategy" for future ASC pressure control requirements.
11. Unit status report - For the PRTU unit, the BAS shall provide an operating status summary of all sensed values (zone temperature, discharge temperature, etc.) setpoints and modes.
 - a. Supply air temp -Damper output %
 - b. Outside air temp -Cool output
 - c. Space temp -Comp Failure
 - d. Fan status -Heat/cool mode
 - e. Sensors Norm/Fail -DDC loop parameters
 - f. Filter Norm/Dirty -Damper Min. Pos. %
12. The following points will be operator adjustable and/or automatically reset by a BAS program.
 - a. Cooling setpoint -Cool reset setpoint
 - b. Economizer setpoint-OA changeover
 - c. Minimum Position setpoint -Static press. setpoint
 - d. Damper open/close -Cool/ disable
13. Diagnostic/Protection - The BAS system shall be able to alarm from all sensed points from the rooftop units and diagnostic alarms sensed by the unit controller. Alarm limits shall be designated for all sensed points.
14. Supply Air Temperature Control - The BAS shall maintain the supply air temperature for the A/C unit by controlling in sequence: (1) outside air/exhaust air/return dampers and modulating the mechanical refrigeration. If the supply CFM falls below 60% of rated capacity, the BAS shall raise the temperature setpoint by (1) degree F every (5) minute interval until CFM is above 55 degrees, then reverse sequence shall occur.
15. Variable Air Volume Terminal Units

- a. Direct Digital Controls
 - 1) General. DDC Controls, actuator and factory costs to mount, calibrate and test the system shall be the responsibility of Section 15900 ATC/Building Management System Contractor.
 - 2) Terminal unit manufacturer shall provide price for factory mounting and continuity check of direct digital controls to the ATC contractor. Field mounted DDC controls are not acceptable.
 - 3) Multi-point, multi-axis flow ring or cross sensor to be furnished and mounted by terminal unit manufacturer. Single point or flow bar sensors are not acceptable. Shall be capable of maintaining airflow to within +/- 5 percent of rated unit airflow setpoint with 1.5 duct diameters straight duct upstream from the unit.
- b. Variable Air Volume Terminal Unit Control
 - 1) The VAV terminal units shall be individually controlled by a DDC controller mounted on each terminal unit. The DDC VAV controller, damper motor, transducer and transformer shall be supplied by the BAS contractor and furnished to the terminal unit supplier. The cost to factory mount, calibrate and test the controller, transducer, transformer and actuator shall be coordinated prior to bid day and included in the BAS price.
 - a) To assure proper operation and control, the BAS contractor as part of this bid shall recalibrate the transducers six (6) months after acceptance of the BAS system to correct any deviations as a result of transducer drift.
 - 2) Submit a copy of the recalibration report to the Engineer, Mechanical Contractor, Test, Adjust and Balance Contractor and Owner.
 - 3) The BAS shall perform the following Terminal unit control strategies and provide the points as listed on the DDC point list and the specified monitoring and diagnostics.
 - a) Grouping - The BAS shall be able to group vav boxes via keyboard commands. These groups shall make it possible for the operator to send a common command to all boxes in a group to operate in the same mode. A sample of this group report must be provided in the submittal package for approval by engineer and owner. BAS shall also compile on a group basis, the following:
 - 1. Minimum group temperature
 - 2. Maximum group temperature
 - 3. Average group temperature
 - 4. Current airflow through boxes in group (total)
 - b) Setpoint Control - The BAS shall edit the zone space temperature setpoint of each VAV box. The zone temperature setpoint shall be operator adjustable. Individual zone setpoint and control logic shall reside at the zone level, and not be dependent upon the BAS for

- control. In the event of communication loss, the box will continue to control to current setpoint.
- c) Cooling Valve Control - The BAS shall control the cooling air valve to a fully open, fully closed, maximum CFM or minimum CFM position based on operator commands. The operator shall also have the capability to adjust the maximum & minimum airflow limits of the air valve through the BAS.
 - d) Operating Mode - The BAS shall place the box in either the occupied or unoccupied mode based on an operator adjustable time schedule. Separate heating & cooling setpoints shall be enterable for each mode through the BAS. Other modes available for special applications shall include full open, full closed, maximum flow, and minimum flow.
 - e) Control Offset - The BAS shall be capable of offsetting the cooling or heating setpoints of one or more groups of boxes by an operator adjustable amount. This capability will allow for automatic zone setpoint changes based on system requirements, such as demand limiting.
 - f) Automatic Recalibration - The system shall automatically recalibrate its air flow sensing & air valve position measurement system at system startup and on a scheduled basis.
 - g) Remote Setpoint Adjustment - The BAS zone temperature setpoint programmed in software shall be capable of being manually overridden by a remote adjustment at the temperature sensor. This manual readjustment feature may be disabled through the BAS, if desired. This feature is not required for terminals serving corridors only or those indicated on the plans to have a zone temperature sensor only.
 - h) Override Button - The VAV box shall be capable of being placed in the "occupied" mode by pressing an override button mounted on the zone temperature sensor.
 - i) The BAS shall have a system wide adjustable override timer to bring any thermostat or sensor back to the BAS programmed setpoint.
 - j) Terminal unit status reports - For each terminal unit, the BAS shall provide an operating status summary of all unit sensed values (zone temperature, CFM, etc.), setpoints, and modes.
 - k) Terminal unit group report - For each group of VAV terminal units, the BAS shall report the group mode, heating and cooling airflow, average zone temperature, minimum zone temperature, and maximum zone temperature. The report shall also display for each terminal unit in the group the present temperature control setpoints and the current zone temperature.
- 6) Zone Thermostats
- a) Zone setpoint adjustment.

- b) Night setback temperature override button to provide occupied conditions during unoccupied times.
 - c) Night setback override cancel button to end the override condition
 - a. The zone sensor shall be accurate to within 0.5 F. The sensor shall be a product of the VAV box controls manufacturer and designed specifically for the installed controller.
 - d) The zone sensor shall have the following features:
 - b. Same as Zone Thermostats except zone sensors are not required to have remote zone setpoint adjustment.
- 7) Terminal box diagnostics.
- a) If zone temperature sensor input fails above its high range, unit shall control at its maximum CFM setpoint. If sensor input fails below its low range, unit shall control to its minimum CFM setpoint.
 - b) In both cases, all heat outputs shall be disabled. A diagnostic message shall be displayed upon operator inquiry.
 - c) If flow-measuring system fails, unit shall automatically convert to a pressure dependent, damper position based algorithm. Diagnostic message shall be displayed upon operator inquiry.
 - d) If zone temperature setpoint potentiometer on zone sensor fails, unit shall automatically control to programmed occupied setpoints. Diagnostic message shall be displayed upon operator inquiry.
 - e) If communications are lost, controller shall continue to operate in the current mode of operation. All setpoints shall be retained in nonvolatile memory. If communications are not restored within 15 minutes, unit shall automatically initiate a reset-recalibrate.

16. Sequence of Operation

- a. VAV Cooling, dual minimum with Electric reheat Terminals
 - 1) In the cooling mode, as the room temperature increases, the unit thermostat modulates the cold airflow from the lower minimum to the maximum setting.
In the heating mode, the unit references the alternate higher heating minimum airflow, then modulates the Electric reheat coil in stages. The reheat coil operates only in the heating mode.
In the Morning Warm-up and when provided the appropriate signal, the damper in the terminal modulates to the maximum airflow position. Heated air from the central system moves through the duct. When the signal is removed, the unit resumes normal control of airflow. With the central system now supplying cold airflow, the terminal unit controller shall determine the heating or cooling mode.

3.4 EXHAUST FAN CONTROL

- A. Local exhaust fans: The exhaust fans shall be started and stopped via a local switch. This work shall be performed by the Electrical Contractor.

3.5 MISCELLANEOUS HEATING

- A. Electric Cabinet Unit Heaters: Units shall operate via an integral thermostat provided by the unit manufacturer.

END OF SECTION 15900

SECTION 16010 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The provisions of the Instruction to Bidders, General Conditions, Supplementary Conditions, Alternates, Addenda, and Division 1 are a part of this Specification. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. Contractors and Sub-contractors shall examine same as well as other Divisions of the Specifications which affect work under this Division.
- B. Electrical, Architectural, Mechanical, Structural and all other drawings as well as the specifications are a part of the Contract Documents.
- C. Material or labor which is not indicated on the Drawings or Specification but which is obviously necessary to complete the work (and is usually included in similar work) shall be provided. Drawings and specifications are to be considered as supplementing each other. Work specified but not indicated, or indicated but not specified, shall be provided as though mentioned in both specifications and drawings.
- D. Visit the site of the work and become familiar with conditions affecting the installation. Submission of a proposal shall presuppose knowledge of such conditions and no additional compensation shall be allowed where extra labor or materials are required because of ignorance of these conditions.
- E. Equal and Equivalent: Shall be understood to mean of the same quantity, size, number, value, degree, intensity and the items are similar in all respects. The final decision of acceptance of these items will be made by the Engineer. It shall be understood that for any specified item on the drawings and in the specifications, this term shall apply.
- F. Where the word "provide" appears, it shall be interpreted to mean the Contractor shall furnish all labor, materials, equipment and supplies necessary to install and place in operating condition.
- G. Material and work required under this and other sections of this Division such as concrete, masonry, reinforcing steel and painting, etc. required and/or not specified in detail, shall be as specified in other applicable divisions covering such work.

1.2 WORK INCLUDES

- A. Include all labor, material, equipment, services, permits and certificates of inspection necessary for the proper completion of all electrical work. Items omitted, but necessary to make the electrical system complete and workable, shall be understood to form part of the work.

- B. It is the purpose of the Electrical Drawings to indicate the approximate location of all equipment, outlets, etc. Ascertain exact locations and arrange work accordingly. The right is reserved to effect reasonable changes in the location of outlets up to the time of roughing-in without additional cost to the Owner. Changes in location of outlets or equipment necessitated by interference with the work of other trades shall be made only with the consent of the Architect's or Owner's representative and at no additional cost.
- C. Work Shall Include:
- Feeders and Panelboards
 - Lighting and Power Wiring
 - Lighting Fixtures and Lamps
 - Cabinets and Pull Boxes
 - Voice/Data Conduit System
 - Extension of Fire Alarm System
 - Extension of Nurse Call System
 - Connections to Owner furnished equipment
- D. Wire items normally associated with equipment supplied by others such as limit switches for door operator motors and motor operated dampers.
- E. The Electrical Design is based on the National Electrical Code. The Electrical Contractor shall include in his bid the cost of providing materials and equipment necessary to satisfy local or regional codes.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Temperature Controls are provided and wired by the Mechanical Contractor under Division 15.
- B. Starters - supplied as an integral part of the equipment shall be furnished under the Division providing the equipment. Wiring and disconnect shall be under Division 16. All other starters and auxiliary control equipment shall be supplied and wired under Division 16 unless otherwise noted.
- C. The Electrical Contractor shall be responsible for coordinating with other trades; mechanical, plumbing, etc., and shall verify equipment and device voltage, phase and ampacity specification. This Contractor shall furnish and install all necessary wiring, raceways and protective devices, etc., as required for the correct and proper operation of the installed equipment, in accordance with the manufacturer's recommendations.
- D. Decorative lighting fixtures may be furnished by the Owner. Installation and wiring shall be under this Division. All other lighting fixtures shall be furnished, installed and wired under this Division. Fixtures furnished by the Owner are indicated on the lighting fixture schedule.

1.4 MATERIAL SUBSTITUTIONS

- A. These Specifications establish quality standards of materials and equipment to be provided. Specific items are identified by Manufacturer, Trade Name or Catalog Designation. This contractor shall submit his base bid price based upon standard specified equipment described herein and as detailed on drawings and associated contract documents.

Substitution equipment accepted as detailed below shall be shown as a separate add or deduct price to be factored into the base bid price by the Architect and Owner if accepted.

- B. These specifications are not to be considered propriety and the Contractor may submit materials or manufacturers (other than those listed) for review by the Architect and Engineer no later than ten (10) days before bids are submitted. Manufacturers of products accepted by the Architect and Engineer will be listed in an addendum to the specifications as an acceptable equivalent. Should the Contractor propose to furnish materials and equipment other than those specified, or approved by addendum, submit a written request for substitutions to the Architect at the bid opening. The request shall be an alternate to the original bid; be accompanied with complete descriptive (Manufacturer, Brand Name, Catalog Number, etc.) and technical data for all items. Failure by this Contractor to submit the requisite documentation detailed above shall be understood by the Architect and engineer to indicate that substitute equipment will not be presented by the Contractor for consideration. Such substitutions will not be considered after the bid opening date and delay of project will not be permitted for further inspection and evaluation after this date.
- C. Where such substitutions alter the design or space requirements indicated on the drawings, include all items of cost for the revised design and construction including cost of all allied trades involved.
- D. Acceptance or rejection of the proposed substitutions shall be subject to approval of the Architect and Engineer. If requested, the Contractor shall submit (at his cost) inspection samples of both the specified and the proposed substitute items.
- E. In all cases where substitutions are permitted, the Contractor shall bear any extra cost of evaluating the equality of the material and equipment to be provided.

1.5 CODES, PERMITS AND FEES

- A. Secure and pay for all permits and inspections required for electrical work. Turn over all certificates of approval, by governing agencies, to the Architect for transmittal to Owner before payment is made for the work.
- B. Give the proper authorities notices as required by law relative to the work in his charge. Comply with the regulations regarding temporary enclosures, obstructions or excavations and pay all legal fees involved.
- C. Work shall be installed in accordance with the provisions of the National Electric Code, as interpreted by the local board having jurisdiction, as well as any further modifications or

regulations of local or state authorities.

- D. Provisions of the latest revisions to the Federal Occupational Safety and Health Act (OSHA) shall be satisfied.

1.6 TESTS

- A. After installation, test for grounds, short circuits and proper function. Faults in the installation shall be corrected.
- B. Insulation resistance tests shall be made on the electrical system with approved megohmmeter and resistance/continuity test on grounding system.
- C. Conduct such tests and adjustments of the equipment as required by the Architect or necessary to verify performance requirements. Submit data to the Architect.

1.7 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEM

- A. Before final payment, demonstrate to the Owner's satisfaction the proper operation of each of the systems comprising this Contract.
- B. Instruct the Owner's maintenance personnel in the operation and maintenance of all electrical equipment and controls.

1.8 EQUIPMENT IDENTIFICATION

- A. Name Plates
 - 1. Provide name plates on all equipment of the type listed in the following schedule:
 - a. Panelboards and Distribution Panels
 - b. Motor Starters
 - c. Safety Switches
 - d. Control Panels
 - e. Control Devices
 - f. Junction and Pull Boxes
 - 2. Lettering shall include name of equipment, horsepower, voltage rating and service designation.
 - 3. Name plates shall be laminated phenolic with a black surface and white core. Name plates may be attached to wall adjacent to equipment if area for attachment is too small.
 - 4. Nameplates on panelboards recessed in walls in finished areas may be on inside of door.

5. Nameplates on panelboards, distribution panels, etc., in unfinished areas should be on exterior trim near top.

B. Cabinet Markings

1. Cabinet and panel doors shall be marked with identification numbers used on the Drawings.

C. Branch Circuit Identification

1. Identification of branch circuits shall be typewritten on Directory Cards furnished with all panels and placed in the card holder on the door. Spare circuits shall be left blank for future identification.

1.9 CLEANING AND FINISHING

- A. After all tests have been completed, clean all equipment leaving everything in working order at the completion of this work.
- B. All debris created by the execution of this work shall be removed.

1.10 CUTTING, PATCHING AND PAINTING

- A. Avoid cutting into the work of others by using sleeves, inserts, chases and similar items necessary for the installation.
- B. Except where otherwise specified or noted on drawings, do all cutting and patching of the building as required to install sleeves, inserts, conduits and electrical equipment. Patching shall be done by mechanics skilled in the various trades. Work shall match the general construction work. All cutting shall be done in a manner to retain the structural integrity of the unit being cut. Where existing equipment is removed or relocated, patch to match the existing building finishes (walls, ceilings, floors, etc.).
- C. Painting shall be provided under other Divisions of this Specification.

1.11 TEMPORARY ELECTRIC SERVICE

- A. Provide a temporary electrical service adequate in size for the use of all trades and the lighting of each room during construction. Include all utility company charges for providing a temporary service to the job site.
- B. Temporary wiring shall be to O.S.H.A. requirements.

1.12 COORDINATION WITH OTHER TRADES

- A. Consult the drawings covering the work for the various other trades, the field layouts of the Contractors for the trades and their shop drawings. Govern accordingly in laying out work.
- B. Keep fully informed of the progress of the general construction. Install work that is to be concealed within the building construction in sufficient time to secure proper location without delay to the work of other trades. All conduit and outlet boxes concealed in masonry construction shall be installed during wall construction. Attend electrical work during the progress of building-in to prevent misalignments and damages to the electrical work.
- C. Examine the work of other trades when their work comes in contact with or is covered by this work. Do not attach to, cover up, or finish against any defective work, or install work in a manner, which will prevent proper installation of the work of other trades.
- D. All outlets, switches and receptacles shall be centered with regard to paneling, trim equipment, etc., and shall line up with either bottom or top of masonry courses.
- E. Take all field measurements necessary and assume responsibility for their accuracy.
- F. This section shall be reviewed in accordance with Section 16010 - 1.03 (related work specified elsewhere).

1.13 LAYOUT DRAWINGS

- A. Layouts for conduit runs, floor holes and sleeves must be made to coordinate with the other trades, and reviewed by the Construction Manager and Architect.

1.14 GUARANTEE

- A. Guarantee all workmanship and materials provided under the contract for one year after acceptance by the Owner and repair or replace any defect without cost to the Owner.
- B. Where damage to other work or furnishings was caused by the defects, or by the work correcting the defects, the damages shall be restored or replaced at the Electrical Contractor's expense to that originally existing prior to the damage.

1.15 SUBMITTALS

- A. Submit drawings and wiring diagrams in accordance with Division I on all items of equipment provided for review by the Engineer. These shall include the following:

- Lighting Fixtures, Ballasts, and lamps
- Panelboards
- Fire Alarm System
- Wiring Devices
- Lighting Controls

Nurse Call System

- B. The submittals will be reviewed only for general compliance and not for dimensions, quantities, etc. The submittals that are returned shall be used for procurement. The responsibility of correct procurement remains solely with the Contractor.

The submittal review shall not relieve the Contractor of responsibility for errors or omissions and deviations from the contract requirements.

- C. The Contractor shall insure submittals bear the Contractors' dated approval stamp and indicate all options. If the submittal shows variations from the requirements of the contract documents, for any reason, the Contractor shall make specific mention of such variation in his letter of transmittal. The Contractor shall note in red on the submittal any change in design or dimension on the item submitted including changes made by the manufacturer, which may differ from catalog information.
- D. Contractor agrees that shop drawing submittals processed by the Engineer are not change orders; that the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to provide and by detailing the fabrication and installation methods he intends to use.
- E. Contractor further agrees that if deviations, discrepancies, or conflicts between shop drawing submittals and the contract documents in the form of design drawings and specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed.
- F. Contractor shall submit list of manufacturers he intends to use on project ten (10) working days after award of contract of items noted in paragraph "A".

1.16 RECORD DRAWINGS

- A. Each Contractor or Sub-contractor for Electrical work shall keep one complete set of the contract working drawings on the job site on which he shall record any deviations or changes from such contract drawings made during construction. Record shall show changes in:
1. Size, type, capacity, etc. of any material, device or piece of equipment.
 2. Location of any device or piece of equipment.
 3. Location of any outlet or device and associated wiring.
 4. Routing of feeder conduits.
- B. These Drawings shall also record the location of all concealed telephone and electric service conduits by indication of measured dimensions to each such line from readily identifiable and accessible walls or corners of the building.

- C. These Drawings shall be kept clean and undamaged, and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
- D. After the project is completed the information on these sets of Drawings shall be transferred to a wash-off mylar set of drawings, made from original design tracings and be delivered to the Architect in good condition, as a permanent record of the installation as actually constructed.

1.17 OPERATING, MAINTENANCE AND SERVICE MANUALS

- A. Before final payment, demonstrate to the Owner's satisfaction the proper operation of each of the systems comprising this Contract.
- B. Instruct the Owner's maintenance personnel in the operation and maintenance of all electrical equipment and controls.
- C. Furnish three complete bound sets of operating and maintenance instructions for all electrical equipment and controls.
- D. Service manuals shall be assembled into one book, which shall include the following:
 - 1. Provide written instructions for each system listed in the Specifications.
 - 2. Submit one copy to the Architect for approval.
 - 3. After approval, submit three (3) copies to the Architect for delivery to the Owner.
 - 4. Bind the written operating instructions, shop drawings, equipment catalog cuts and manufacturer's instructions into a hard-backed binder where they can be accommodated into 8- 1/2" x 11" size. Material to be assembled as follows:

First Page---Title of Job, Owner, Address, Date of Submittal, Name of Contractor and Name of Engineer.

Second Page---Index.

Third Page---Introduction to First Section containing a complete written description of the system.

First Section---Written description of system contents, where actually located in building, how each part functions individually, and how system works as a whole. Conclude with a list of items requiring service and either state the service needed or refer to the manufacturer's data in the binder that describes the proper service.

Second Section---A copy of each Shop Drawing with an index at the beginning of the section.

Third Section---A copy of each manufacturer's operating instructions with an index at the beginning of the section.

Fourth Section---A list of all equipment used on the job. Contractor's purchase order numbers, supplier's name and address.

Fifth Section---A copy of each wiring diagram utilized in the installation.

Sixth Section---Copies of all warranties, approvals, etc.

- E. Deliver to the Owner all special tools and appurtenances for proper operation and maintenance of the equipment provided and request receipt for same, and attach to the Contractor's request for final payment.

1.18 WORKMANSHIP

- A. Workmanship shall be in accordance with the best practices of the trade. Electrical work shall be installed by journeymen electricians under the supervision of a competent foreman.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

- A. Equipment and materials used on this job shall be new, U.L. Labeled, and O.S.H.A. approved.
- B. Equipment and materials shall be protected and be the responsibility of this Contractor until formally accepted by the Owner.
- C. All manufacturers of electrical equipment shall verify to the satisfaction of the Contractor and Engineer that their equipment will function properly under the conditions of use as indicated on the drawings and as specified herein. Dimensions, weights, operating characteristics and all other related appurtenances shall be verified before submittal of shop drawings.
- D. Contractor shall insure that all equipment suppliers understand that their equipment is required to meet specific ratings and requirements under actual installed conditions.

2.2 ACCESS DOORS

- A. Contractor shall furnish steel access doors and frames applicable for such locations in walls, partitions, ceilings, etc., requiring access to concealed junction boxes, devices and equipment for service or inspection to the specification Contractors designated by the Architect for installation. Electrical Contractor shall not be responsible for installation of such access doors.

- B. Location, type, size and number shall be determined by Contractor to suit equipment requirements for bidding purposes. Minimum door size to be 16" x 20". All doors and locations must be approved by the Architect.
- C. Respective Contractors, as designated by the Architect shall install required access doors and frames in designated locations after such locations are approved by Architect.
- D. Access door shall be flush type, manufactured from No. 14 gauge steel; complete with flush flange type frames, manufactured from No. 16 ga. steel and provided with anchors.
- E. Access doors located in fire-rated walls, floors, ceiling-floor or ceiling-roof assemblies shall be fire rated access doors, Underwriters Laboratories, Inc., listed and labeled.
- F. Prime paint entire door and frame assembly before leaving factory.
- G. Doors and frames shall be similar to and equal to those as manufactured by Inryco, Newman Brothers, Inc. Birmingham Ornamental Iron Co., or Miami-Carey.

2.3 FIRE STOPPING

- A. Annular space between sleeves and conduits shall be sealed with O.Z/Gedney Type "CFSF", "CFSI", or "CAFSI" fire seals or equal. Fire seals selected shall have hourly fire-rating equal to or higher than fire-rating of floor, or wall.
- B. For walls rated less than 2 hours, space between sleeves and conduit shall be packed with fire resistant mineral fiber similar to U.S. Gypsum "Thermafiber", Dow Corning 3-6548 Silicone RTV foam, General Electric Co. RTV 850 Silicone RTV foam, or Chase Technology Corp., CTC PR-855 fire resistant foam sealant.

2.4 SOUND STOPPING

- A. Space between wall or partition and conduit shall be packed with a fire resistant mineral fiber similar to U.S. Gypsum "Thermafiber", Dow Corning 3-6548 Silicone RTV foam, General Electric Co. RTV 850 Silicone foam or Chase Technology Corp., CTC PR-855 fire resistant foam sealant. Refer to architectural specifications for other approved systems.

2.5 MISCELLANEOUS STEEL

- A. Contractor shall furnish and install all miscellaneous carbon, galvanized, stainless steel required for supports, hangers, anchors, etc., or as may be required for installation of equipment and material furnished and installed under this Division.
- B. Design all miscellaneous steel in accordance with AISC Steel Handbook and as specified under Division 5, "Structural, Miscellaneous Steel and Metal Work". Give all such steel one coat of primer paint as specified under Division 5 and 9, unless otherwise noted.

- C. Refer to architectural specifications for other approved systems.

2.6 SUPPORTING DEVICE

- A. All hangers and supports shall conform to latest requirements of ANSI Codes, Underwriters Laboratories, Inc., Listed where applicable.
- B. Steel angle iron.
- C. Steel channel, fittings, brackets, beam clamps as manufactured by Unistrut, Allied and Kindorf or an approved equal.
- D. Metal framing, fittings, etc., as manufactured by Unistrut, Allied and Kindorf or an approved equal.
- E. Concrete inserts, etc., as manufactured by Unistrut, Allied and Kindorf or an approved equal.
- F. Rustproof self drilling anchor, sleeve anchor, stud anchor, expansion shield (malleable iron or die cast), expansion anchor similar to those as manufactured by "Red Head", ITT Phillips Drill Co.; Unifast Industries, Inc.; Star; Rawl; Arro, Division Mid-Con or an approved equal. Size as indicated on drawings.
- G. Concrete wedge anchors material shall be zinc plated carbon steel. Wedge anchors shall be similar to Unifast Industries, Inc. or an approved equal.

PART 3 - EXECUTION

3.1 EQUIPMENT CONNECTIONS

- A. Serve and connect equipment being installed during the construction period but provide facilities only for serving equipment that will be moved in, set and connected later by the Owner. Provide cords and caps where required and fusetron fuses in switches left for future equipment connections.
- B. Provide all wiring, devices, junction boxes, etc., for connection of kitchen equipment. Circuiting requirements are indicated on the Electrical Drawings and exact requirements and mounting heights are listed on the food service drawings. Verify all connection requirements before roughing-in work.

3.2 IDENTIFICATION

- A. After finished painting is complete, identify each feeder cable and conduit service. Locate identification:

1. Behind each access door.
 2. At each change of direction and at junction boxes.
 3. At not more than 40 feet apart in straight runs of conduit behind removable enclosures such as lay-in type ceiling, but on both sides of sleeves through walls of floors.
 4. Above each floor or platform for vertical exposed conduits, preferably 60" above floor or platform.
 5. Use stencils and stencil paint or lamacoid plates or permanent marker for identification.
 6. Use minimum 1" high letters.
 7. The identification shall describe system voltage and service, i.e. "277/480 Volt lighting to panel AA".
- B. Identify conduits and outlet boxes for the various systems by the use of the following distinctive color paints. Apply a small area of paint to the inside of each outlet box, pull box and panel as it is being installed. Identify junction boxes in suspended ceilings areas with color on both inside and outside.

| | |
|---------------------|----------|
| 120/208 Volt System | - Black |
| Voice System | - White |
| Fire Alarm System | - Red |
| T.V. System | - Blue |
| Data System | - Yellow |
| Nurse Call | - Gray |

NOTE:

Where the Owner has an existing color coded system then that format shall be followed unless specifically stated otherwise.

END OF SECTION 16010

SECTION 16050 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL

A. Work Includes

Conduits
Wire and Cable
Cabinets
Wiring Devices
Motor Starters
Disconnect Switches
Supporting Devices

B. Related Work Specified Elsewhere

1. Section 16010 - Electrical General Provisions

C. Products

1. Materials and equipment used on this project shall meet O.S.H.A. requirements.
2. Material and equipment built into the work for which examination service is provided shall bear the Underwriter's Label.
3. Materials and equipment provided under this Contract shall be new and of the quality herein specified. Each class of materials shall be of the same type and make throughout the building.

PART 2 - PRODUCTS AND EXECUTION

2.1 CONDUITS

A. Materials

1. Conduit shall be rigid galvanized or intermediate grade in exterior masonry walls; masonry walls below grade; concrete floors, walls or slabs; or exposed below 8 feet above finished floor. Use P.V.C. in ground applications. All other interior conduits may be EMT. Conduits shall be of sizes required to accommodate the number of conductors in accordance with the National Electrical Code wiring tables or as indicated on the drawings, whichever is larger.
2. Rigid conduit fittings shall be threaded fittings. Rigid conduit couplings and hubs to

have no less than five (5) threads of conduit engaged and screwed up tight. Use set screw/compression type fittings for thin wall metallic tubing less than 2", use set screw type for conduit 2" and above.

3. Where types of conduits are not stipulated then, proper selection of material shall be determined by the installer to fulfill wiring requirements, and comply with applicable Articles of The National Electric Code (NEC).
4. Manufacturers shall be as specified below:
 - a. Electrical Metallic Tubing (EMT) shall be hot-dip galvanized as manufactured by Allied Tube and Conduit, Triangle PWC Inc., or approved equal.
 - b. Intermediate Metallic Conduit (IMC) shall be as manufactured by Allied Tube & Conduit, Triangle PWC Inc., or approved equal.
 - c. Galvanized rigid steel conduit as manufactured by Allied Tube & Conduit, Triangle PWC Inc. or approved equal.
 - d. Aluminum conduit as manufactured by Electri-Flex Co., Anamet Inc., or approved equal.
 - e. Plastic conduit schedule 40 PVC, 90 deg. C. as manufactured by Carlon, Thomas & Betts Corp., or approved equal.
 - f. Flexible Metal conduit as manufactured by Electri-flex, Greenfield Alflex Corp., or approved equal.
 - g. Liquid-tight flexible metal conduit as manufactured by Electri-Flex, Greenfield Alflex Corp., or approved equal.
 - h. Liquid-tight flexible non-metallic conduit, typically Carlon "Carflex" or approved equal.

* The Contractor shall provide appropriate and complete fittings per manufacturer's directions.
5. Make conduit connections to motors with flexible metal conduit, as specified herein, of the same size as the feeder conduit, and make such connection as short as practical.
6. All conduits that pass through the roof shall be approved and coordinated with the Architect. RPS Corporation and Thycurb Corporation are acceptable, unless otherwise noted by the Architect.
7. All conduits that are indicated on the drawings to be run exposed on the building roof shall be supplied with pipe roller supports as manufactured by the Pate Co. and shall be installed as recommended by the manufacturer. RPS Corporation and Thycurb Corporation are acceptable.
8. Service conduits and their installation are as required by the Utility Companies.
9. Exterior underground conduit shall be P.V.C. schedule 40, and must be encased in 6" of concrete under drives or roadways. The transition to rigid conduit must be made before the conduit enters the building.

B. Execution

1. Conduits shall be continuous and be secured to all boxes in a manner that each system shall be electrically continuous from point of service to all outlets. Terminals of all conduits shall be provided with locknuts and bushings. Plug ends of each conduit with an approved cap or disc to prevent the entrance of foreign materials during construction.
2. Conduits run in floor slab or concrete work shall have a minimum of one (1") inch of concrete cover and clean threads.
3. Provide expansion conduit fittings at all points where conduits cross building expansion joints.
4. Run exposed conduit parallel to, or at right angles to, building structural members. Vertical runs are to be plumb.
5. All conduit terminating in sheet steel enclosures shall have double locknuts and a bushing. Locknuts shall be a type that will "bite" into the metal of the box. All bushings shall be of the insulating type.
6. Conduit shall be run concealed in finished areas.
7. Conduits shall not be run on the exterior of the building or on the roof unless specifically indicated on the drawings. The routing of such conduits shall be approved by the Architect.
8. Homeruns to panels shall be 3/4" minimum.
9. Conduit in ground floor shall be run under the slab, but may not be run in slag.
10. Provide empty conduits with #12 pull wires.
11. Exterior underground conduits shall be 24" below grade, minimum, unless otherwise noted in Chapter 3 of the N.E.C.
12. Conduit entry into building shall be watertight. Underground joints shall be sealed.
13. Conduit supporting systems shall be attached to the deck, slab, or structural framing only and not to any other appurtenances at the ceiling such as mechanical ducts, pipes and suspended ceiling hanger wires or framing members.
14. Conduits shall be supported by steel or malleable clamps as manufactured by Appleton, B-Line, or American Electric, or architect approved equal.
15. Conduits or other raceway systems that penetrate fire or smoke rated walls, ceilings, decks, partitions, etc. shall be constructed so as to maintain the integrity of the fire or smoke rated areas. Refer to fire-stopping section of Specifications

16010.

16. A separate ground must be run in all P.V.C. conduit. Conduit size shall be increased to accept ground when required. Vertical transitions shall be made with rigid steel ells.
17. Various types of conduit shall be used in accordance with the following schedule:

| | Under Concrete floors or Slab | Exposed | Non-Load Bearing Partition or above Ceilings | Exterior or load Bearing Walls | Exterior Under- ground |
|---------------------------|--|---------|--|---|------------------------------|
| Galvanized Rigid Steel | Yes | Yes | Yes | Yes | No |
| Aluminum | No | Yes | Yes | Yes | No |
| Intermediate | Yes | Yes | Yes | Yes | No |
| EMT | No | Yes | Yes | No | No |
| PVC-Rigid 40/80 | Yes | No | No | No | Yes |
| ENT | No | No | No | No | No |

2.2 WIRE AND CABLE

A. Materials

1. Wire and cable for power and lighting feeders shall be 600-volt type THHW or XHHW copper.
2. Wire and cable for power and lighting branch circuits shall be THHN copper for #10 and smaller and THHW or XHHW copper for #8 and larger.
3. Minimum wire size for power and lighting circuits shall be #12. Wire sizes #12 and smaller shall be solid. Wire sizes #10 and larger shall be stranded.
4. Individual circuits are indicated on the drawings for clarity. Circuits may be grouped for homeruns. Note that the applicable N.E.C. adjustment factors must be applied.
5. The Electrical Contractor shall install separate neutrals for each individual branch circuit unless noted otherwise.
6. Control wires shall be #14 stranded THWN copper.
7. Feeders or branch circuits in extremely hot locations where ambient temperatures are 90 degrees C. or above shall be type AVA.

8. Cords for makeup connections to portable equipment shall be 600 volt, heat resistant, rubber insulated, portable cable with neoprene jacket type "SO" and "W" of extra flexible stranded copper.
 9. Provide wire and raceway systems as described herein and as indicated on the drawings. Metal-Clad (MC), Armored Cable (AC) and Non-Metallic Sheathed Cable (NMC) shall not be permitted.
- B. Manufacturers: subject to compliance with specific installation requirements, provide products of one of the following approved manufacturers. American Insulated Wire Corp., Pirrelli Cable Company, Rome Cable Company, Triangle PWC, Inc., and Houston Wire & Cable Company.
- C. Execution
1. Wire shall be delivered to the job in complete coils with manufacturer's name and approval tag indicating wire size and type of insulation, fastened to each coil.
 2. Where size is not indicated, Conductor size #12 minimum shall be used for circuits less than 120 feet and size #10 minimum shall be used for circuits greater than 120 feet. Wire sizes shall be determined based upon insulation type, group derating factors and ambient temperature factors.
 3. Pull wire and cables into conduit using Ideal Industries "Yellow 77".
 4. Leave 6 inches free at all outlets for wiring device connection.
 5. Mechanical means may be used to pull #4 and larger.
 6. Joints in #10 and smaller wire shall be made with Minnesota Mining and Manufacturing Co. insulated "Scotch Locks", Ideal Co. "Wing-Nut", T & B Co. "Piggy" connectors, or with mechanically crimped sleeves as manufactured by T & B Co., or Ideal Co. Connector sleeves shall be insulated with pressure sensitive electrical tape equal to Minnesota Mining and Manufacturing Co. Scotch No. 33 "plus" or Raychem Corp. heat shrinkable tape.
 7. Joints in #8 and larger shall be made with pressure type mechanical connectors and insulated with electrical tape to 150% of the insulating value of the conductor insulation.
 8. Color code wire and cable for circuits as called for in the National Electric Code.
 9. Tag ends of all control & communication wires with "Brady Tags" or equivalent.
 10. All mechanical wire & cable terminations shall be torque-tightened with torque wrench or torque screwdriver to manufacturer's recommended torque values.

2.3 CABLE SUPPORTS

- A. Cable support bodies shall be malleable iron castings with hot dip galvanized finish, furnished complete with locknuts for rigid conduits and also EMT, size to cable requirements.
- B. Cable support fitting shall be threaded at the top to allow fastenings to enclosure.

2.4 OUTLET BOXES

- A. All outlet boxes upon which lighting fixtures are to be installed shall be equipped with 3/8-inch fixture studs.
- B. All boxes shall be rigidly supported from building structure independent of the conduit system. Boxes cast into masonry or concrete are considered to be rigidly supported.
- C. Flush device boxes in masonry walls shall be masonry boxes designed for the purpose, or 4-inch square boxes with raised square covers designed for masonry.

Flush boxes in other walls shall have proper raised covers suitable for wall material.
- D. Wiring device boxes for surface conduit work shall be FS series cast boxes.
- E. Boxes feeding recessed fixtures in furred ceilings shall be accessible through ceiling opening. Provide 4 feet of 1/2-inch flexible steel conduit between box and fixture housing. Type THHN fixture wire shall be used between the box and the fixture housing. Provide No. 12 green copper bonding conductor between outlet box and fixture where flexible metallic conduit is used as a raceway.
- F. Cabinets
 - 1. Electrical Contractor shall furnish and install cabinets suitable for the use indicated as shown on the drawings.
 - 2. Cabinets shall be flush or surface mounted and of sizes indicated on the drawings.
 - 3. Approved manufacturers for cabinets shall be: Hoffman, Carlon or Architect approved.

2.5 WIRING DEVICES

- A. Materials
 - 1. Local light switches unless noted otherwise on the symbol legend shall be back and side wired, 20 ampere, 120/277 volts, AC Specification Grade. Manufacturers and their catalog numbers indicated are acceptable.

| | Hubbell | Pass & Seymour | Leviton | Bryant | Arrow Hart |
|----------------|-----------|----------------|----------|---------|------------|
| a. Single pole | HBL1221 | 20AC1 | 1221 | 4901 | 1991 |
| b. Three-way | HBL1223 | 20AC3 | 1223 | 4903 | 1993 |
| c. Four-way | HBL1224 | 20AC4 | 1224 | 4904 | 1994 |
| d. Pilot light | HBL1221PL | 20AC1-RPL | 1221-PLR | 4901PLR | 1991PL |

NOTE: Catalog numbers for pilot light and lighted handle switches are for 120V circuits. Verify catalog numbers for 277V circuits.

*Catalog numbers shown are for brown. Colors shall be selected by Architect.

- Switches installed in door mullions shall be 120/277 volts A.C., 20 ampere, despard type, with 1-3/4" wide stainless steel cover plates. Ground the door mullion.
- Convenience outlets for 120-volt general use shall be duplex 20 ampere, 125 volt, 3 wire, grounding type. The top shall be of high impact thermo-plastic such as nylon. The strap shall be heavy-duty steel that wraps around the device. Ground contacts shall be brass and riveted to the strap. Automatic ground clip shall be provided. Manufacturers and their catalog numbers listed are acceptable.

| Hubbell | Pass & Seymour | Leviton | Bryant | Arrow Hart |
|---------|----------------|---------|--------|------------|
| 5362 | 5362 | 5362 | 5362 | 5362 |

*Catalog numbers shown are for brown. Colors shall be as selected by Architect.

- All switch and convenience outlet plates shall be smooth finish, thermoplastic material such as nylon to suit outlets provided. To insure uniform color, plates and devices shall be of one manufacturer. Use #304 stainless steel cover plates.
- Ground fault interrupter receptacles, where required, shall be Hubbell #GF5362.
- Manual motor starters shall be Westinghouse type "MS" with pilot light or equal by I.T.E., Cutler-Hammer, Square-D, or G.E.
- Weatherproof receptacles shall be Hubbell #GF5362 duplex outlet with Taymac #20510 safety outlet enclosure (in compliance with NEC 410-57b).

B. Execution

- Provide receptacles and switches as indicated. Colors shall be selected by Architect and coordinated with wall color. Verify before installation.
- Adjacent devices shall be mounted in ganged boxes.
- Mounting heights to center of box unless otherwise indicated shall be:

- a. Switches 4'-0"
 - b. Receptacles 18"
 - c. Voice/Data 18"
 - d. All other outlets to be verified with the architectural drawings.
4. Verify mounting heights and locations with Architect before rough-in. See Architectural Details and Elevations. Coordinate locations with mirrors.
 5. Outlets shall not be installed back to back.
 6. The inside cover of all receptacle outlet plates shall be permanently marked to indicate the panel and circuit number of the outlet.
 7. Electrical Contractor shall verify door swings for proper location of switches prior to rough-in.

2.6 DISCONNECT SWITCHES

- A. Disconnect switches, unfused or fused, single throw, shall be installed where indicated on the Drawings and/or where required by Code. Switches shall be heavy duty for indoors or outdoors as required and manufactured by Square D, General Electric, ITE, or Westinghouse, Cutler-Hammer.
- B. If double lugging or oversized wires are required, provide a wireway or splice box.

2.7 FUSES - 600 VOLTS AND LESS

- A. Fuses shall not be installed until equipment is ready to be energized. All fuses shall be of the same manufacturer to assure selective coordination.
- B. The Electrical Contractor shall provide a complete set of fuses for all fusible equipment on the job. Unless otherwise indicated, all fuses shall be U.L. listed, current-limiting and have an interrupting rating of 200,000 RMS amperes symmetrical.
- C. All fuses rated 600 amperes or less shall be time-delay current-limiting U.L. class J, unless indicated otherwise. They shall be:
 1. Gould Shawmut Amp Trap II; AJT, AYJ
 2. Bussmann Low Peak; LPJ_SP, JKS
 3. Reliance Fuse: JCL
- D. All fuses rated 601 through 6000 amperes shall be current limiting U.L. Class L. They shall be:
 1. Gould Shawmut Amp Trap; A4BY
 2. Bussmann Limitron; KLU

3. Reliance Fuse: LCU

- F. Provide cable limited fuses (600V) for all feeders having multiple parallel conductors. Install at each end of cable as manufactured by Bussmann or equal.

2.8 SUPPORTING DEVICES

- A. All hardware, supports, hangers, angle iron, channels, rods, clamps necessary to install electrical equipment and lighting fixtures shall be supplied to suit conditions and application. The use of perforated straps will not be permitted.
- B. Supporting devices shall be galvanized or aluminum material.

2.9 EQUIPMENT MOUNTING

- A. All equipment mounted on exterior walls shall be attached to 3/4" plywood boards furred out 1" from wall. Provide painting of plywood boards - finish as selected by the Architect.

2.10 MOTOR STARTERS

- A. Provide motor starters (magnetic or fused combination) and control equipment where shown. Starters shall be with 120-volt coils, 3 overloads, control transformer with fused 120-volt secondary control circuit, (2) N.O. and (2) N.C. auxiliary contacts, hands-off-auto selector switch and running pilot light, unless otherwise noted. Wire through control devices furnished by other trades. Since motor driven equipment is furnished by other trades, the control indicated on the Drawings shall be considered as for bidding purposes only. Wire to conform to the actual equipment supplied and installed by the other trades. All fuses shall be dual element type. Provide "blown fuse" indicator lamps in cover.
- B. Starters shall be as manufactured by Square D, General Electric, Cutler-Hammer, Westinghouse, or I.T.E.
- C. The exact number of normally open and normally closed auxiliary contacts in each starter shall be determined by the Architect's Electrical Engineer and Aquatics Design Consultant.
- D. Coordinate all equipment indicated on the electrical drawings with mechanical equipment schedules and specifications and provide motor starters for all equipment indicated as being interlocked or started from a remote location.

END OF SECTION 16050

SECTION 16060 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 WORK INCLUDES

Grounding

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - Electrical General Provisions
- B. Section 16050 - Basic Electrical Materials and Methods
- C. Section 16400 - Power Distribution Equipment

PART 2 - PRODUCTS

2.1 GROUNDING

- A. Ground all conduits, cabinets, motors, panels, fixtures, and other exposed non-current carrying metal parts of electrical equipment in accordance with all provisions of the National Electrical Code and local codes.
- B. System neutral current conductors shall be grounded at the source, but they shall not be used for equipment grounding. Ground system neutrals at transformers.
- C. Ground all conduits by means of grounding bushings on terminations at panelboards with an installed #12 conductor to grounding bus.
- D. Grounding of the electrical system shall be by means of an insulated grounding conductor installed with circuit conductors in all conduits. Grounding conductors shall be sized in accordance with N.E.C. 250.122 and shall run from grounding bus of serving panel to ground bus of served panel, grounding terminal of receptacles, lighting fixture housings, grounding terminal of light switches or metal enclosures of served equipment.
- E. Conductors for grounding system shall be soft or medium hard drawn, stranded, bare copper except where otherwise noted.
 - 1. All conductors #8AWG and smaller shall be insulated.
- F. Conductors for grounding grid and connection of equipment or other item to grounding grid shall be #1/0 AWG minimum.
- G. Where grounding conductors are subject to mechanical injury they shall be protected by encasement in concrete or installed in a rigid metallic raceway.

- H. Install bonding jumpers across all buildings, expansion joints, and across conduit expansion fittings.
- I. Provide lugs, connectors, fasteners, etc., to install a complete grounding and bonding system as defined in TIA J-STD-607-A.

PART 3 - EXECUTION

3.1 GROUNDING

- A. The resistance to ground for the entire grounding system shall not exceed 25 ohms under normal dry conditions.
- B. Tests of grounding resistance shall not be made within 24 hours after a rainfall. If after testing the system, it is found that the resistance to absolute earth exceeds 15 ohms, the Contractor shall install the necessary number of ground rods to reduce the resistance to less than 15 ohms. These tests shall be conducted in the presence of the local Electrical Inspector. The test results shall be submitted to the Architect/Engineer.
- C. All electrical equipment shall be grounded as per National Electrical Code Article 250 and all other applicable articles.
- D. All cabling shall be bonded and grounded per TIA 607A.
- E. All bonding conductors and connectors shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL).
- F. Bonding conductors should not be placed in a ferrous metallic conduit. If it is necessary to place bonding conductors in a ferrous metallic conduit that exceeds three feet (3') in length, the conductors shall be bonded to each end of the conduit with a No. 6 AWG conductor.
- G. Each telecommunication bonding conductor shall be marked appropriately by a distinctive green color and shall be labeled.
- H. All installation work shall be done in a neat high quality manner and in conformity with local, state and federal building codes.

END OF SECTION 16060

SECTION 16400 - POWER DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDES

Circuit Breaker Panelboards
Circuit Breaker Distribution Panelboards

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - Electrical General Provisions
- B. Section 16050 - Basic Materials and Methods
- C. Section 16060 - Grounding and Bonding

PART 2 - PRODUCTS

2.1 CIRCUIT BREAKER PANELBOARDS

- A. Provide branch circuit breaker panelboards equipped with circuit breakers of the frame and trip rating as specified herein and as shown on the contract drawings.
- B. Panelboard bus structure and main lug/main circuit breaker shall have the current rating as shown on the contract drawings. Bus bar connections shall accept bolt-on circuit breakers.
- C. Panelboards shall be dead front safety type. Bus bars shall have anti-turn solderless lug connections for attaching feeders. Where multi-pole circuit breakers are required, they shall be common trip.
- D. All panelboards shall be lockable and keyed alike. Panel boxes shall be at least 20 inches wide.
- E. Panelboard covers shall be a "door in door" trim (cover hinged to the tub type).
- F. Multiple section panelboards shall comprise of matching tubs, sized identically and abutted to one another. Covers and trims shall be identical and be suitable for surface/flush tubs as indicated on the drawings.
- G. Circuit breakers shall be thermal magnetic, molded case bolt-on type.
- H. Panelboard as a complete unit shall have a minimum short circuit rating of:

208/120 - 22,000 AIC, unless otherwise noted for panels MP1 and EDP.

- I. Provide an uninsulated ground bus with necessary quantity of terminals to accept all the branch circuit ground conductors.
- J. Provide a 100% rated neutral bus. Provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections.
- K. Panelboards shall be listed by the Underwriters Laboratories and bear the "UL" label. Panelboards shall be manufactured by Square D, Siemens, General Electric, or Eaton Electric (Cutler-Hammer).

PART 3 - EXECUTION

3.1 CIRCUIT BREAKER PANELBOARDS

- A. Panelboards shall be mounted so that the panel's highest circuit breaker device is below 6'-7" from the floor and the bottom of panel is at least 18" above floor. Where the above stated mounting requirements cannot be achieved, the contractor shall consult the engineer prior to installation.
- B. A glazed directory frame shall be provided inside the door and shall be of sufficient size to give description of each circuit. Typed directory cards shall be provided listing each circuit served.
- C. Panelboards indicated with double lugging or oversized conductors on the drawings shall be installed with oversized tub, wireway, or splice box (flush mounted if required).
- D. Flush mounted panelboards shall be installed with a minimum of three empty 3/4" conduits stubbed up to accessible ceiling space for convenient future expansion.
- E. When work is complete, balance the continuous load on each phase of all panelboards.
- F. Provide engraved nameplate matching panelboard designation on the drawings.
- G. Dedicated equipment space shall be provided for panelboards. Prior to installing panelboards and their associated incoming/distribution feeders and branch circuits, contractor shall coordinate panelboard locations with HVAC and plumbing contractors to ensure dedicated space is maintained per NEC Article 110.26.

END OF SECTION 16400

SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.1 GENERAL

A. Work Includes

Interior Lighting
Exterior Lighting

B. Related Work Specified Elsewhere

1. Section 16010 - Electrical General Provisions
2. Section 16050 - Basic Materials and Methods
3. Section 16060 - Grounding and Bonding

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES (LUMINAIRES)

- A. Shall be as specified on the lighting fixture schedule as indicated on the drawings.
- B. Where fixture types are indicated as a manufacturer's series, the contractor shall provide the correct trim, mounting hardware, appurtenances, lengths, etc., to complete the installation as indicated on the electrical/architectural drawings.

2.2 BALLASTS

- A. All ballasts for indoor lighting fixtures shall have a type "A" sound rating classification minimum.
- B. Fluorescent fixtures shall have thermally protected, high power factor (>99%), U.L. Listed, Class P, CBM, ETL, and CSA Certified, one, two, three, and/or four lamp (as required), rapid start, parallel, high frequency, T-8, electronic (<10% THD) ballasts, with 5 year minimum warranty. Approved manufacturers shall be Magnetek/Triad HP, or Advance Centium. (Valmont "Ultra-Miser" or Osram/Sylvania "Quicktronic")
- C. Compact fluorescent and/or T-5 fluorescent fixtures shall have thermally protected, high power factor (>98%), U.L. Listed, Class P, CBM, ETL, and CSA Certified, one, two, and/or three lamp (as required), rapid start, parallel, high frequency, electronic (<10%) ballasts. Approved manufacturers shall be Motorola, Energy Saving Inc., or Robertson.

2.3 LAMPS

- A. Provide all lamps required. At the conclusion of the work, each fixture must be equipped with the proper number of new lamps of the correct size and type, all in good operating condition.
- B. Incandescent lamps shall be 130 volt only.
- C. Fluorescent lamps shall be T-8, SP35X and SPX41 (for O.R.'s) medium Bi-Pin lamps with a CRI-85 Tri-Phosphor coating. Approved fluorescent lamp manufacturers shall be G.E., Philips, or Osram/Sylvania.
- D. Compact fluorescent lamps shall contain amalgam additives and be provided with end of life protection. Lamp colors shall match all other fluorescent lamps. Approved compact fluorescent lamp manufacturers shall be G.E., Philips, or Osram/Sylvania.

PART 3 - EXECUTION

3.1 LIGHTING FIXTURES

- A. All fixtures shall be securely supported with approved hangers. Fixtures shall be supported from structural ceiling or structural supports, not suspended ceiling supports. Fluorescent recessed fixtures must be supported at the four corners and secured to suspended ceiling supports in accordance with the N.E.C. Surface mounted fixtures must have additional ceiling support as acceptable by the Architect.
- B. Provide low temperature ballasts on all exterior fixtures.
- C. All fluorescent fixtures requiring lenses shall be furnished with .125" virgin acrylic lenses minimum, unless otherwise noted.
- D. This Contractor shall insure that similar lamp types are of the same manufacturer and color temperature and that fixtures and lamps are compatible.
- E. All lamps shall be operational at project hand-over.
- F. Plaster frames shall be furnished for each recessed fixture installed in plaster ceilings.
- G. Recessed incandescent fixtures shall have thermal cut-out protection in accordance with the National Electrical Code.
- H. The Contractor shall confirm all ceiling types with the Architect and insure that fixtures are suitable for those ceilings i.e., fire rated, damp location, etc.
- I. Install remote low voltage incandescent transformers 20 feet or less from lamp.
- J. Coordinate exit sign mounting locations with door arrangements. Connect exit signage and

egress lighting to local unswitched power source per state and local code.

- K. Connect fixtures designated as night lights to unswitched circuit(s) to operate continuously.
- L. Insure that all wall-mounted fixtures are compliant and installed in conformance with ADA requirements.
- M. The installation of lay-in fixtures shall be completed in a manner that will not impede the removal of adjacent ceiling tiles. Obstruction of these tiles, unless to maintain fire ratings, shall not be permitted.

END OF SECTION 16500

SECTION 16700 - COMMUNICATIONS

PART 1 - GENERAL

1.1 GENERAL

A. Work Includes:

Telephone/Data/Television Conduit Systems

B. Related Work Specified Elsewhere

1. Section 16010 - Electrical General Provisions
2. Section 16050 - Basic Materials and Methods

PART 2 - PRODUCTS AND EXECUTION

2.1 TELEPHONE/DATA CONDUIT SYSTEMS

A. Description

1. The Electrical Contractor shall provide a complete system of cabinets, outlet boxes, conduit and miscellaneous fittings and materials to provide complete telephone/data raceway systems. Equipment, terminals, cable and the associated labor shall be furnished by others under a separate agreement with the Owner.

B. Products and Execution

1. Desk telephones shall have wall boxes mounted 18 inches above finish floor unless otherwise indicated. The boxes shall be 4-11/16 inches square with single gang plaster ring. The cover plate shall be provided by others.
2. Wall telephones and pay telephones shall each be provided with a box similar to the one specified for the desk telephones. Mounting shall be at 48".
3. All conduits required for telephone/data outlets as shown on the drawings shall be provided complete with pull strings. Conduit shall be 3/4" minimum. Provide conduit from each outlet to above the accessible finished ceiling with bushing on end.
4. Provide a 3/4" non-metallic conduit and #6 copper wire, or its equivalent in ampacity from the entrance terminal location of the main building ground.
5. Data outlets shall have boxes and cover plates similar to the ones being provided for the desk telephones above.

6. All conduits required for the television outlets as shown on the drawings shall be provided complete with pull strings. Conduit shall be 3/4" minimum. Provide conduit from each outlet box to above the accessible finished ceiling with bushing on end.

END OF SECTION 16700

SECTION 16710 – EXTENSION OF EXISTING AUDIO/VISUAL NURSE CALL SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

Extension of Existing Audio/Visual Nurse Call System

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - Electrical General Provisions
- B. Section 16050 - Basic Materials and Methods

1.3 SCOPE OF WORK

- A. The Electrical Contractor shall furnish, install and wire all equipment, accessories and material complete in strict accordance with Specifications and applicable Drawings as required for an electronic Audio/Visual Nurse Call System. All material and/or equipment necessary for proper operation of the system not specified or described herein shall be deemed part of the Specifications.

1.4 STANDARD PRODUCTS

- A. The equipment furnished under this Specification shall be the standard product of one manufacturer. Catalog numbers are intended to indicate the type and quality of design and material as well as operating features required.
- B. Equipment shall be designed by the manufacturer to operate as a complete system and shall be accompanied by the manufacturer's complete service drawings detailing all interconnections.
- C. The equipment in this Specification is that of the Rauland-Borg Responder 4000 Series Audio/Visual Nurse Call System.

1.5 SERVICE FACILITIES

- A. The Contractor shall make available to the purchaser a local service department of a duly authorized distributor of the equipment manufacturer which shall stock the manufacturer's standard parts. On-the-premises maintenance shall be provided during normal working hours at no cost to the purchaser for a period of twelve (12) months from date of formal written acceptance by the Owner unless damage is caused by misuse, abuse or accident. On-the-premises service furnished at other than normal working hours shall also be available and shall be charged for by the manufacturer's distributor at current labor rates.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The Contractor shall furnish and install the Audio/Visual Nurse Call devices for the system extension.
- B. Equipment proposed shall meet the most current version of Underwriter Laboratories, Inc. standard for safety UL1069 code for hospital signaling and nurse call equipment. Satisfactory acknowledgment of the listing shall be submitted with the proposal. Each major component shall bear the manufacturer's name and model number.

2.2 SYSTEM DESCRIPTION

- A. The system shall have voice communication capabilities between patient and nurse stations as outlined in these Specifications.
- B. Continued operation of all audio and visual signals shall be maintained automatically in the event of momentary interruption of the AC power source. The audio and visual signals shall continue to operate until the call is canceled at the point of origin.
- C. The system shall consist of annunciator panels and duty stations which shall display the status of the system. Annunciator panels shall be equipped with individual lamp indicators to display the call status of all locations in the system.
- D. The system shall also consist of dome lights with color sections representing the various call levels in the system.

2.3 OPERATION OF SYSTEM

- A. A call placed from any system station shall:
 - 1. Light a call placed lamp indicator on the station. The lamp indicator shall remain illuminated until the station is reset.
 - 2. Light a corresponding corridor dome light and associated zone lights.
 - 3. Sound distinct electronic audio and visual signals at the master station and/or duty stations.
- B. Color sections in the dome and zone lights shall represent the following call levels:
 - 1. Level one - White color indicating room help station calls.
 - 2. Level two - Green color indicating toilet, and dressing room emergency help station calls.
- C. Distinct electronic audio and visual signals at the master station and/or duty stations shall be coded as recommended by the system supplier.

2.4 SYSTEM COMPONENTS

- A. The cabinets shall include the required equipment panel and system cards, boards, and modules for complete extension system installation.
- B. Master stations shall be microcomputer controlled wall mounted type stations, furnished with the required wall outlet and plug-in system cord. Wall outlet shall be flush mounted with an appropriate backbox. In addition to features mentioned previously in the Specifications, master stations shall include, but are not limited to, the following features:
 - 1. Call priority sequencing
 - 2. Programmable patient priority status
 - 3. Unanswered call reminder tones
 - 4. Time of day display
 - 5. Hands free or handset operation
 - 6. Volume controls
 - 7. Call initiation to single stations or groups of stations
 - 8. Numeric touch sensor keypad
- C. Duty stations: The duty stations shall operate in conjunction with dome lights and zone lights in order to display system calls. The duty stations shall consist of a call indicator lamp and a tone module. The tone module shall distinguish between normal and emergency calls. The station shall be capable of two-way voice communication.
- D. Toilet: The stations shall be provided with a pullcord and reset button with "Pull for help" (or similar) designation. Pullcord shall extend to 6" AFF.
- E. Patient emergency help stations: The stations shall be provided with call and reset buttons.
- F. Dome and zone lights shall be wall or ceiling mounted with green and white sections.
- G. All system devices shall be flush mounted unless otherwise specified. Provide faceplates, backboxes, watertight gaskets, and non-conductive nylon screws as recommended by system supplier.
- H. Wiring - All system wiring shall be in accordance with the manufacturer's recommendations and shall be performed in compliance with the National Electrical Code and applicable State and Local Codes. The entire wiring system shall be tested free of opens, grounds and between conductor shorts prior to applying power. Provide wiring in plenum approved cable.

PART 3 - EXECUTION

3.1 SUBMITTALS

- A. Submittals shall include a bound brochure with a data sheet for all equipment specified and installation drawings. Drawings shall indicate exact wiring requirements and shall include equipment locations shown on reproducible vellum floor plans (1/16" scale, minimum). These drawings shall be dedicated solely to indicate the nurse call system and related wiring.

3.2 NURSE CALL SYSTEM INSTALLATION SERVICES

- A. A representative of the system manufacturer shall supervise final connections; test, program, and adjust entire system; and train Owner's personnel in operation and maintenance of the system. The training session shall be video taped by the Contractor for future Owner use.

END OF SECTION 16710

SECTION 16732 – EXTENSION OF EXISTING SMALL ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDES

Extension of Existing Small Addressable Fire Alarm System

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 16010 - Electrical General Provisions
- B. Section 16050 - Basic Materials and Methods

1.3 QUALITY ASSURANCE

- A. The existing Fire Alarm System is listed as a product of a single fire alarm system manufacturer, is U.L. labeled and meets the requirements of the NEC, NFPA, ASME/ANSI and all State and Local Codes. All control equipment shall be listed under U.L. category UOJZ as a single control unit. All system components shall be FM approved.
- B. The system controls shall be U.L. listed for Power Limited Applications.
- C. The complete system shall conform to the latest requirements of the American's with Disabilities Act (ADA).
- D. State of Ohio Certification for installation of Fire Alarm Systems shall be provided prior to start of installation.

1.4 DESCRIPTION OF WORK

- A. Furnish and install a complete, operating, multiplexed, addressable Fire Alarm System as specified herein. Include sufficient wiring, conduit, terminations, electrical boxes, and all other necessary material for a complete operating system.
- B. The Fire Alarm Control Panel software shall allow initiation circuits to be individually configurable on-site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit. Notification appliance circuits shall be individually configurable on-site to provide, upon activation, a PNIS code until deactivated or reset upon any output circuit. The PNIS coded pulse on and off time may be selectable on-site to provide 16 different duty cycles between 1/4 second and 5 seconds. All hard-wired initiation and control circuits shall be individually configurable, on-site, in any combination, to provide either initiating circuit, notification circuit, or auxiliary control circuit operation.

- C. The system shall have the capability of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history.
- D. All panels and peripheral devices shall display the manufacturer's name on each component.
- E. New devices shall match existing installed system.

1.5 DESCRIPTION OF FIRE ALARM SYSTEM OPERATION

- A. The system alarm operation after activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:
 - 1. All audible alarm indicating devices shall sound a continuous fire alarm signal until the system is reset.
 - 2. All visible alarm indicating devices shall flash continuously until the system is reset.
 - 3. All doors normally held open by door control devices shall release.
 - 4. A supervised signal to notify the local fire department and/or monitoring service shall be activated.
 - 5. All smoke dampers shall close as described on the drawings.
 - 6. The Smoke Control System shall be activated as described on the drawings.
 - 7. All mechanical air handling units are equipped with duct smoke detectors shall shutdown in accordance with NFPA 90.
 - 8. All security system doors shall unlock.
 - 9. Power to all automatic doors at rated partitions shall be disabled.
- B. Fire Alarm Control Panel Operation
 - 1. Under normal condition, the front panel shall display a "SYSTEM NORMAL" message and the current time and date.
 - 2. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.
 - 3. Pressing the appropriate acknowledge button shall acknowledge the alarm or trouble condition. The acknowledge functions may be passcode protected. The total number of alarms, supervisory, and trouble conditions shall be displayed chronologically.

4. Alarm Silencing
 - a. Should the "Alarm Silence" button be pressed, all notification appliances shall be deactivated.
 - b. Notification appliances shall not be deactivated during alarm silence inhibit mode.
5. System Reset
 - a. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied. Should an alarm condition continue to exist, the system will remain in an abnormal state. System control relays shall not reset. The panel audible signal and the Alarm LED shall be on. The display will indicate the total number of alarms and troubles present in the system along with a prompting to review the points. These points will not require acknowledgment if they were previously acknowledged.
6. Function Keys, Display of System Detail Information
 - a. Additional function keys shall be provided to access status data for all system points.
7. Control Switches
 - a. Fire Control Switches shall be programmable to control exhaust fans and supply fans.
8. History Logging
 - a. In addition to any required printer output, the control panel shall have the ability to store events in an alarm log and events in a separate trouble log.
9. Walk Test with History Logging
 - a. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.

The momentary disconnection of an initiating or notification appliance circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.

The control panel shall be capable of supporting up to eight (8) separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing

data may be retrieved from the system in chronological order to ensure device/circuit activation.

Should an alarm condition occur from an active point, not in walk test mode, it shall perform all standard programmed alarmed sequences.

10. System Trouble Reminder

- a. Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the Owner's application.

11. Access Levels

- a. Systems shall be capable of manual command operations via passcode or key operated switches.

12. Detection Operation

- a. Smoke sensors shall be smoke density measuring devices having no self contained alarm set point (fixed threshold). The alarm decision for each sensor shall be determined by the control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to the stored values.
- b. The control panel shall maintain a moving average of the sensors' smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. The system shall automatically maintain a constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. Photoelectric sensor smoke obscuration sensitivity shall be adjustable to within limit of the UL window (0.5% to 4.0%) to compensate for any environment.
- c. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined level, a "DIRTY SENSOR" trouble condition shall be audibly and visibly indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location. If a "DIRTY SENSOR" is left unattended, and its average value increases to a second predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel for the individual sensor. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation. For scheduling of maintenance, the control panel shall be able to generate an "ALMOST DIRTY" indication for any sensor approaching a "DIRTY" trouble condition.
- d. The control panel shall continuously perform an automatic self-test routine on each sensor which will functionally check sensor electronics and ensure

- the accuracy of the values being transmitted to the control panel. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition with the sensor location at the control panel.
- e. An operator at the control panel shall have the capability to manually access the following information for each sensor:
 - primary status
 - device type
 - present average value
 - present sensitivity selected
 - peak detection values
 - sensor range (normal, dirty, etc.)
 - f. An operator at the control panel shall have the capability to manually control the following for each sensor:
 - clear peak detection values
 - enable or disable the point
 - clear verification tally
 - establish alarm sensitivity
 - control a sensor's relay driver output
 - g. It shall be possible to program the control panel to automatically change the sensitivity settings of each sensor based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied times and less sensitive during occupied periods). There shall be seven (7) sensitivity settings available for each sensor.
 - h. The control panel shall have the capability of being programmed for a pre-alarm or two-stage function. This function allows an indication to occur when, for example, a 3% sensor reaches a threshold of 1.5% smoke obscuration.
 - i. For increased smoke detection assurance, all individually addressed smoke sensors shall be provided with alarm verification. Only a verified alarm shall initiate the alarm sequence operation.

13. Miscellaneous Control Panel Operations

- a. The control panel is to have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.
 - 1) The activation of any standpipe or sprinkler valve tamper switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel. Differentiation between valve tamper activation and opens and/or grounds on fire alarm initiation circuit wiring shall be provided.
 - 2) Activating the Supervisory Service Acknowledge Switch will silence the supervisory audible signal while maintaining the Supervisory Service LED on indication that the tamper contact is still in the off-normal state.
 - 3) Restoring the valve to the normal position shall cause the Supervisory Service LED to extinguish thus indicating restoration to normal position.
- b. A manual evacuation switch shall be provided to operate the systems alarm notification appliances.

- c. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system.
- d. Alarm and trouble conditions shall be immediately displayed on the control panel front alphanumeric display. If more alarms or troubles are in the system, the operator may scroll to display new alarms. The system shall have an alarm list key that will allow the operator to display all alarms, troubles, and supervisory service conditions with the time of occurrence.
- e. All doors normally held open by door control devices shall release upon AC power failure.

14. Supervision

- a. The system shall contain up to 4 Class 'B' (Style 'B') independently supervised initiation circuits so that a fault in any one zone shall not affect any other zone. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
- b. There shall be 4 independently supervised and independently fused notification appliance circuits for alarm horns and flashing alarm lamps. Disarrangement conditions of any circuit shall not affect the operation of other circuits.
- c. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.
- d. The incoming power to the system shall be supervised so that any power failure must be audibly and visibly indicated at the control panel (and the remote annunciator).
- e. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visibly indicated at the control panel.
- f. The System Expansion Modules shall be electrically supervised for module placement. Should a module become disconnected from the controls, the system trouble indicator must illuminate and audible trouble signal must sound.
- g. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

15. Power Requirements

- a. The control panel shall receive 120 VAC power via a dedicated circuit breaker.
- b. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of twenty-four (24) hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
- c. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

16. Addressable Peripheral Network

- a. The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:
 - 1) Alarm
 - 2) Trouble
 - 3) Open
 - 4) Short
 - 5) Ground
 - 6) Device Fail/or Incorrect Device
- b. All addressable devices are to have the capability of being disabled or enabled individually.
- c. Identification of Addressable Devices
 - 1) Each addressable device must be uniquely identified by an address code.

PART 2 - PRODUCTS

2.1 ADDRESSABLE SYSTEM ACTIVATION DEVICES

- A. Addressable smoke and heat detector heads shall be pluggable into their bases. The bases shall contain electronics that communicate the detector status to the Control Panel. Upon removal of the head, a trouble signal will be transmitted to the Control Panel.

1. Analog Addressable Smoke and Heat Detectors

- a. The smoke detectors shall be of the photoelectric type and shall communicate actual smoke chamber values to the Control Panel.
- b. The heat detectors shall sense within a temperature range of 32°F to 158°F. The Control Panel shall be capable of sensing either a setpoint of 135°, or a rate-of-rise of 15°F per minute for fire sensing.
- c. The detectors shall be listed to UL Standard 268 and shall be documented as compatible with the control equipment to which they are connected. They shall be listed for both ceiling and wall mount applications.
- d. Each base shall contain an LED that shall flash each time it is scanned by the Control Panel (once every 4 seconds). When the Control Panel determines that a detector is in an alarm or a trouble condition, the Control Panel shall command the LED on the base to illuminate continuously, indicating the abnormal condition. Bases requiring a relay shall be provided with a relay.

*Audible smoke detectors shall be provided with a sounder base.

- e. Each detector shall be scanned by the Control Panel for its type identification to prevent inadvertent substitution of another detector type.

- The Control Panel shall operated with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed detector type is changed.
- f. The detector's electronics shall be immune from false alarms caused by EMI and RFI.
 - g. The Control Panel shall determine the condition of each detector by comparing the current sensor value to the stored values.
 - h. Detectors shall be compatible with other addressable detectors, addressable manual stations, and addressable interface modules on the same circuit.
 - i. For elevator control smoke and heat detectors, provide (2) N.O. and (1) N.C. auxiliary contact. The detectors shall be monitored through an addressable interface module.
- B. Addressable pull stations shall contain electronics that communicate the station's status to the Control Panel. They shall be manufactured from high impact red Lexan. The station shall mechanically latch upon operation and remain so until manually rest by opening with a key common to all system locks. Pull stations shall be double action, semi-flush mounted.
- * Protective Shield: Provide a tamperproof, clear polycarbonate shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85 db at 10 feet and shall be powered by a 9 VDC battery.
- C. Addressable interface modules shall be used for monitoring or control of devices and systems as described on the drawings.
- 1. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable initiating circuit.
 - 2. Addressable interface modules shall be supervised and uniquely identified by the Control Panel. Device identification shall be transmitted to the Control Panel for processing according to the program instructions. Should a module become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the Control Panel.
 - 3. The modules shall be capable of being programmed for individual locations on the addressable device initiating circuit. The modules shall be compatible with addressable manual stations and addressable detectors on the same addressable initiating circuit.

2.2 NOTIFICATION DEVICES

- A. Audible/visible devices shall be 75 cd minimum. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the

light pattern in key axis directions. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8". In its quiescent state, the word "FIRE" shall be visible. All visible devices shall flash in a synchronized pattern. The audible portion of the appliance shall be a single frequency 4" electronic optically controlled vibrating horn rated at 87 dbA at 10 ft. Frequency response shall be 2000 Hz nominal.

- B. Visible only devices shall be 75cd. The light unit shall be of ABS polycarbonate and the lens of high grade, optical quality LEXAN. For optimized light distribution, the xenon flash tube shall be installed perpendicular to the appliance's back plane. A special compound reflector shall be utilized to maximize and best distribute the light pattern in key axis directions. The effect of the illuminated visible appliance shall be observable in a circumpolar pattern. The visible appliance shall be labeled with the word "FIRE" in a contrasting color and the height of each character shall be a minimum of 5/8". In its quiescent state, the word "FIRE" shall be visible. All visible devices shall flash in a synchronized pattern.

2.3 PERIPHERAL DEVICES

- A. Magnetic Door Holders shall be electrically operated and shall magnetically hold smoke doors in an open position. Operation of the Fire Alarm System shall release the doors. Provide floor mounted, flush, or surface mounted devices as indicated on the drawings.
 - 1. Provide wall extension kits at locations required.

PART 3 - EXECUTION

3.1 PERFORMANCE, WARRANTY, SERVICE AGREEMENT, AND TESTING

- A. The electrical contractor shall furnish and install, in accordance with manufacturer's instructions, all wiring, conduit, outlet boxes, etc., as required for a complete system as described herein and as shown on the drawings. All wiring shall be in conduit and shall meet the requirements of all National, State, and Local Electrical Codes. Wire sizes shall be as specified by the equipment manufacturer. Final connections shall be made under the direct supervision of the manufacturer's factory trained technical representative.
- B. The Riser Diagram shows the intent of these Specifications and shall be used as a guide only. The conduit sizing and number of wires are to be verified with the manufacturer prior to submitting a bid and prior to installation in the building.
- C. Upon completion of the project, the Owner shall be furnished by the contractor a reproducible drawings indicating the actual installation of the Fire Alarm System as constructed showing wiring fill, wire tag numbers, junction boxes and connection of devices.
- D. The electrical contractor shall guarantee all equipment and wiring to be free of mechanical and electrical defects for a period of one year from the date of acceptance by the Owner.

The manufacturer shall furnish, gratis to the owner, a one year contract effective from the date of acceptance for maintenance and inspection service of the manufacturer's equipment. The owner shall deal with one organization for total system responsibility. The manufacturer shall make available to the Owner an extended Maintenance Contract after the initial year's agreement has expired.

- E. The manufacturer shall provide to the owner during the period of the guarantee, emergency preventative maintenance service on a 24 hour standby basis.
- F. The manufacturer shall maintain an adequate supply of spare parts and a full time service facility with factory trained service technicians to provide supervision of the installation.
- G. Upon completion of the installation and after satisfactory testing of the system by the contractor in the presence of the equipment supplier, the contractor shall test the system in the presence of the Architect, Fire Marshall, and/or Owner's Representative, and other authorities having jurisdiction. Provide a written start-up report.
- H. A representative of the system manufacturer shall provide all system testing, and shall instruct the owner's personnel in the operation and maintenance of the system. The training session shall be videotaped by the contractor for future owner use.

3.2 SUBMITTALS

- A. Submittals shall include installation and wiring diagrams and instructions for installation, operation, and maintenance, to be suitable for inclusion in the Maintenance Manuals.
- B. Submittals shall include reproducible vellum floor plans (1/16" scale, minimum) showing device locations, required conduit and wiring connections, battery calculations and voltage drop calculations.
- C. Submittals shall include descriptive literature for all system components, size and type of recommended conduit and wiring, bill of materials, and sequence of system operation.

END OF SECTION 16732

END OF SPECIFICATIONS