PROJECT MANUAL FOR:

GLICKMAN LIBRARY
UNIVERSITY OF SOUTHERN MAINE

Portland, Maine

Project No. 99092

DATED: March 17, 2003

Issued for Construction

Submitted by:

SMRT

ARCHITECTURE
ENGINEERING
PLANNING

144 Fore Street
PO Box 618
Portland, Maine 04104
www.smrt.com
☎ 207 772-3846
207 772-1070

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Notice to Contractors - Long Form (Advertisement)

Sealed Proposals in envelopes plainly marked "Glickman Library, University of Southern Maine" addressed to:

Board of Trustees
University of Maine Portland
c/o Mr. Dana A. Gray
Manager, Engineering and Architectural Services
Facilities Management, University of Southern Maine
96 Falmouth Street
P.O. Box 9300
Portland, ME 04104-9300

will be received until 1:00 p.m. April 17, 2003 at which time and place they will be opened and read aloud.

Proposals must be accompanied by a satisfactory Bid Bond for 5% of the Proposal (checks will not be accepted). The University reserves the right to waive all formalities and reject any and all proposals or to accept any proposal.

The successful bidder will be required to furnish a 100% Performance Bond and 100% Payment Bond to cover the execution of the contract which shall be in conformity with the form of Bonds contained in Sections 00610 and 00620 of the Specifications and for the contract amount.

The Work involves interior renovations to the Glickman Library, University of Southern Maine, at the location indicated on the Drawings. Work includes but is not limited to, selective demolition, minor structural work, repairs to existing roof membrane, metal stud partitions, insulation, gypsum board walls and ceilings, ceramic tile, acoustical ceilings, resilient flooring, carpeting, custom cabinets and fixtures, carpentry, interior aluminum storefront system, painting, metal door, wood doors, metal frames, door hardware, toilet partitions and accessories, fire protection and detection systems, electrical, heating, ventilating, and air conditioning, complete and ready for use.

Subcontractors submitting Proposals to General Contractors for Work listed on General Contractor's Proposal Form and the Notice to Contractor's Form are required to send or deliver a copy of their Proposals to the Maine Construction Bid Depository, 188 Whitten Road (P.O. Box 5519), Augusta, Maine 04332-5519, and to be considered valid, must be received in the Bid Depository on or before 3:00 p.m. on April 10, 2003, in accordance with the supplemental instructions to Bidders, Section 00120, and the General Conditions and Regulations of the Maine Construction Bid Depository, on the form provided.

Subcontract Proposals filed with the Bid Depository must be accompanied by a satisfactory Bid Bond, in conformity with the Form of Bond contained in Section 00415, made out to the Owner, for 5% of the Subproposal Amount, and filed separately in the WHITE envelope.

The selected Subcontractors, required to file their Subproposals with the Bid Depository, will also be required to furnish the selected General Contractor with a 100% Performance Bond and 100% Payment Bond, for their portion of the work.

Subcontractors required to file their Subproposals and Bid Bonds with the Bid Depository are as follows:

Division 13 - Fire Protection
Division 14 – Elevators
Division 15 - Mechanical
Division 16 - Electrical

Official Forms and Envelopes for all Subproposals may be obtained from the Office of the Maine Construction Bid Depository, 188 Whitten Road (P.O. Box 5519), Augusta, ME 04332-5519.

Plans and specifications may be obtained on or after March 17, 2003. The procedure for obtaining documents is as follows:

All General Bidders and Filed Subcontractors must obtain the first full set of Plans and Specifications directly from the Architect, SMRT Inc., 144 Fore Street, P.O. Box 618, Portland, ME 04104 Tel. (207) 772-3846 Attention: Laurie Warhol. General Contractors are required to purchase a minimum of one full set of plans and specifications in order to qualify to submit a contract proposal. It is the responsibility of General Contractors, Filed Subcontractors, and Subcontractors to review full sets of documents to ensure they have complete information to bid. A non-refundable fee of $250 must be prepaid at the Architect's office prior to plans and specifications being picked up at or mailed/UPS from Am-At-Uer Service, 231 Oxford Street, Portland, Maine 04101, Tel. (207) 772-7006. No other printers are authorized to print or reproduce documents, and no partial sets will be issued.

Additional full sets may be purchased directly from Am-At-Uer Service for the cost of printing plus mailing and handling charges. Only those contractors purchasing their first full set through the Architect will be sent addenda. Contractors who are not General Contractors or Filed Subcontractors but who wish to receive addenda may also purchase full sets through the Architect. The non-refundable fee of $250 must be prepaid at the Architect's office prior to picking up or being sent plans and specifications from Am-At-Uer Service.

Documents remain the property of the Architect and shall be returned on demand. Documents are protected by Federal copyright law. Reproduction of documents without written authorization from the Architect or use of such documents for the preparation of bids subjects the bidder to having their bids disqualified.

The documents may be examined at the following places:

Associated Constructors of Maine, 188 Whitten Road, PO Box 5519, Augusta ME 04332-5519, Tel. (207) 622-4741.

Construction Summary of Maine, Inc., 734 Chestnut Street, Manchester NH 03104, Tel. (800) 321-8856, (207) 990-1156 and (603) 627-8856, FAX (603) 627-4525. Plan rooms at 74 Gilman Road, Bangor ME 04401 and c/o W. H. Shurtleff Bldg., 5 Industry Road, South Portland, ME 04106.

F.W. Dodge, McGraw-Hill Information Systems Co., 47 Atlantic Place, South Portland ME 04106, Tel. (207) 774-3488.

F.W. Dodge/Woodrow Cross Agency, 74 Gilman Road, Bangor ME 04401, Tel. (800) 999-7345, FAX (207) 941-0849.

The Dunlap Agency, 31 Court Street, P.O. Box 40, Auburn ME 04210, Tel. (207) 783-2211.

The Dunlap Agency, 260 Harlow Street, P.O. Box 1080, Bangor ME 04402, Tel (207) 942-4671.

University of Southern Maine, Portland, Department of Facilities Management, 25 Bedford Street, Portland, ME 04104.

A mandatory pre-bid site walk-through will begin in Room 423/424 at Glickman Family Library, 314 Forest Avenue, Portland, Maine at 1:00 p.m. on March 24, 2003. This will be the only time available for bidders to inspect the project site.

The anticipated construction start date for this project is May 12, 2003. There will be no construction work performed during the week of June 16, 2003. The anticipated substantial completion date is March 12, 2004.

The University of Maine System in all its activities, subscribes and adheres to the provisions of the Civil Rights Act of 1964 as amended to date. General contractors, subcontractors, and product suppliers bidding on this project must subscribe and adhere to same. There shall be no discrimination in employment because of race, national origin, religion, immigration status, handicapped status, or sex.

UNIVERSITY OF SOUTHERN MAINE, PORTLAND
Samuel G. Andrews, Chief Financial Officer for
University of Maine System Board of Trustees

SECTION 00100

Instructions to Bidders

1. At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents, including all addenda. The failure or omission of any bidder to receive or examine any form, instrument, or document shall not relieve any bidder from any obligation in respect to the bid. The Owner reserves the right to accept or reject any or all bids as may best serve the interests of the University of Maine System.

2. Subject to the University System's right, reserved herein, to accept or reject any or all bids, the General Contractor will be selected on the basis of the sum of the lowest base bid, plus such of the alternates as the University System desires to use.

3. The University System is exempt from the payment of Federal Excise Taxes on articles not for resale and the Federal Transportation Tax on all shipments. The Contractor shall quote less these taxes. Upon application, exemption certificates will be furnished when required.

4. No proposal may be withdrawn during a period of thirty (30) calendar days immediately following the opening thereof.

5. No contract may be assigned, sublet or transferred without the written consent of the University of Maine System.

6. All individuals not residents of this State must comply with the provisions of 14 M.R.S.A. §704-A.

7. The successful bidder, or bidders, will be required to furnish 100% Contract Bonds to cover the execution of the contract, in accordance with Article 23 of the General Conditions.

8. Contractors may be required to furnish a statement of their business experience, record of accomplishments, and financial responsibility, at the discretion of the University System.

9. The base bid shall be based on the materials, methods, equipment and products, as specified.

10. Any materials, methods, equipment and products not herein specified, but worthy of consideration by any General or Subcontractor, may be introduced by a separate letter attached to the regular bid. The Bidder shall state the cost comparison with the specified materials, methods, equipment and products, and the reason for the suggested substitution. It shall be understood by all bidders that the attached letter proposing substitutions shall not be used to determine the low bidder and that all bids are based on specified products.

11. Telegraphic or facsimile proposals will not be considered, but modification of proposals already submitted will be considered if received prior to the hour set for receipt of proposals. If the telegram or facsimile discloses the amount of the proposal, the proposal will be declared invalid. The bidder bears full responsibility to assure that the correction is delivered to the proper location and within the time required.

12. Where a bidder wishes a product to be considered an "approved equal" for bidding purposes, the product, along with all supporting documentation, shall be submitted to the architect for review a minimum of 10 calendar days prior to the bid opening date or the file bid due date, if file bids are required on the project. Products which are determined to be an "approved equal" for bidding purposes shall be listed in an addendum issued so as to be received by bidders no less than 72 hours prior to the bid date or the file bid due date if file bids are required.

13. Where the Proposal Form requires the tabulation of subcontractors other than "File Bidders," the Bidder shall list the name of the firm the bidder intends to use in the event the bidder receives the contract award.

SECTION 00120

Supplemental Instructions to Bidders

For University System Projects, the facilities of the Maine Construction Bid Depository shall be used, and all Subcontract Proposals must be filed in accordance with the Regulations by the Maine Construction Bid Depository, a copy of which is included in these Specifications. Additional copies may be obtained from the Architect or the office of the Associated General Contractors of Maine, Inc., Whitten Road, P.O. Box N, Augusta, Maine 04332-0551.

1. (a) Subcontractors for trades, as listed in the General Contractor's Proposal Form 00300 and the Notice to Contractors Form 00030, are required to deliver (or mail at their own risk) their Proposals to the Maine Construction Bid Depository, Whitten Road, P.O. Box N, Augusta, Maine 04332-0551 and, to be considered valid, must be received in the Bid Depository on or before the time stated in the Notice to Contractors, Section 00030, in accordance with these Instructions to Bidders, on the form provided by the Architect. Any Proposal submitted on an incomplete form may be considered informal and not a valid Proposal.

(b) Subcontract Proposals, filed with the Bid Depository, must be accompanied by a satisfactory Bid Bond, in conformity with the Form of Bond contained in Section 00415, made out to the Owner, for 5% of the Subproposal Amount and filed separately in the WHITE envelope.

(c) After the General Contractor Bid opening, any filed Subcontract Proposal not in conformity with these instructions, or not in conformity with the requirements of the Plans and Specifications shall be declared invalid and the filed Subcontract Proposal of the lowest acceptable Subcontractor will be substituted. Such substitutions will be made prior to the selection of the General Contractor.

(d) At the closing time for filing Subcontract Proposals, if the only filed Subcontract Proposals for any individual trade or trades are filed by a General Contractor, it shall be assumed that such Subcontract Proposal is restricted to said General Contractor and it will not be furnished to other General Contractors. In such an event, the University System shall establish a Lump Sum Allowance for such trade or trades and include it in the letter to General Contractors announcing the names of the Subcontractors filing Subcontract Proposals. This Lump Sum Allowance shall be included in the Proposal of all General Contractors.

(e) In the event a filed Subcontract Proposal is requested, but none received, the University System shall establish a Lump Sum Allowance for that trade and include it in the letter to the General Contractors announcing the names of the Subcontractors filing Subcontract Proposals. This Allowance shall be included in the Proposal of all General Contractors in lieu of a filed Subcontract Proposal.

(f) After opening the filed Subcontract Proposals, if all are found to be invalid for any particular trade or trades, the amounts listed by General Contractors for that trade or trades in preparing their Proposals shall be deducted from the total of the Proposal of each General Contractor and the Contract shall be awarded to the lowest responsible

General Contractor selected after said deductions are made.

(g) Telegraphic or facsimile Subcontract Proposals will not be considered, but modifications by telegram or facsimile of Subcontract Proposals already filed will be considered if received prior to the hour set for receipt of Subcontract Proposals. If the modification discloses the amount of the Subcontract Proposal submitted, the Subcontract Proposal will be declared invalid.

2. (a) Any filed subproposal received from a General Contractor who does not have the qualified personnel or experience for that particular trade shall be considered informal and not a valid Subproposal.

(b) At the expiration of the time stated for the filing of Subproposals, the University System's Office of Facilities will mail to the General Contractors, who have taken Plans and Specifications, the names of Subcontractors who have filed their Subproposals with the Bid Depository in accordance with the provisions of these Instructions to Bidders. If any General Contractor has not received a copy of this list of Subbidders, within a reasonable time following the time set for their delivery, the bidder should contact the Office of Facilities for confirmation of the list of Subbidders who have filed, prior to the completion of the bidder's own Proposal.

(c) General Contractors will be furnished by the Architect two (2) copies of the Proposal Form for General Contractor. One (1) copy shall be filled out and signed and sent to the Owner in a printed envelope furnished by the Architect to arrive on or before the time specified in the "Notice to Building Contractors," Section 00030.

(d) Each proposal by a General Contractor shall be submitted on the form provided, and the list of selected Subcontractors with their respective Subproposals shall be complete. Any Proposal submitted by a General Contractor with an incomplete list of Subcontractors, or with the name or names of Subcontractor or Subcontractors who have not filed in accordance with these Instructions to Bidders, shall be considered informal and as such will not be considered a valid Proposal.

(e) Any Proposal, submitted by a General Contractor, with a Subproposal amount different from the Subproposal Amount filed by that Subcontractor, shall have the Subproposal Amount filed substituted for the Subproposal Amount carried by the General Contractor, and the Proposal of the General Contractor shall be adjusted by the difference, prior to the selection of the low General Contractor.

(f) Telegraphic or Facsimile Proposals from the General Contractors will not be considered, but modifications by telegram facsimile of Proposals already submitted will be considered, if received prior to the hour set for receipt of Proposals . If the modification discloses the Amount of the Proposal submitted, the Proposal will be declared invalid.

3. The Owner reserves the right to reject any Subcontractor not qualified or whose Proposal is invalid under these Supplemental Instructions to Bidders, and will, before the selection of the General Contractor, substitute another Subcontractor who is qualified and who has properly filed.

4. Subject to the Owner's right, reserved herein, to accept or reject any or all Proposals, the General Contractor will be selected on the basis of the sum of the lowest acceptable Proposal plus such of the Alternates as the Owner desires to use, it being understood that the Subcontractors listed in the said Proposal shall be acceptable to the Owner.

5. After the selection of the General Contractor, the Proposals of all Subcontractors will be considered by the Owner, the Architect, and the General Contractor. Any agreement to substitute the names of Subcontractors other than those named in the General Contractor's Proposal shall cause an adjustment of the Contract Amount in accordance with the Owner's copy of the Subcontract Proposals filed with the Bid Depository. If the said Subcontractor or Subcontractors so substituted fail to execute a Subcontract, in accordance with their filed Subproposal, with the selected General Contractor and before a Contract between the Owner and the General Contractor has been executed, the Owner, Architect, and General Contractor shall select from the list of Subcontractors, who filed copies of their Proposals, with the Bid Depository, a new Subcontractor or Subcontractors, and the Contract Amount shall be revised in accordance with the Subcontract Proposals so filed.

6. The selected Subcontractors, required to file their Subproposals with the Bid Depository, are also required to furnish the Selected General Contractor with a 100% Performance Bond and 100% Payment Bond for their portion of the Work, in conformity with the Form of Bonds shown in Sections 00610 and 00620.

SECTION 00120-A

INSTRUCTIONS FOR SUBMITTING BID QUESTIONS

All questions and requests for clarification during the Bidding period must be received on the Bid Question/Clarification Request Form which follows this page. Any modifications, deletions and/or additions to the Contract Documents based on questions or requests for clarification will be made by Addenda.

The deadline to submit bid questions or clarification requests is 5:00 pm on April 3, 2003. The last Addendum for both filed subcontractors and general contractors will be sent out on April 7, 2003. No information will be given out after the release of the last Addendum other than instructions on where to find information in the Contract Documents.

BID QUESTION/CLARIFICATION REQUEST FORM

(please use one form per question)

Project Information:

Date:		Proj Mgr.:	Janet Hansen, AIA
Project Name:	Glickman Library – University of Southern Maine	Distribution:	JLH, LW
		File:	35
Job No.:	99092		

Subject: Bid Question ☐ Clarification Request ☐

Received By: Mail ☐ In Person ☐ Fax ☐

Company Information:

Company Name	
Contact Person	
Address	
Tel No.	
Fax No.	
UPS Address	

Question/Clarification:

Spec Section:		Drawing Number:	
Page No.:		Detail:	

Please mail or fax this form to Laurie Warhol, SMRT, Inc., 144 Fore Street, P.O. Box 618, Portland, ME 04104 Tel: 207 772-3846 ext. 210; Fax: 207 772-1070

SECTION 00121

MAINE CONSTRUCTION BID DEPOSITORY

GENERAL CONDITIONS AND REGULATIONS

NAME AND LOCATION

The Depository shall be known as MAINE CONSTRUCTION BID DEPOSITORY and shall be located at the office of the Associated General Contractors of Maine, Inc., Whitten Road, P.O. Box 5519, Augusta, Maine 04332-0051. Tel 622-4741.

DEFINITION AND PURPOSE

The Bid Depository is a system designed to maintain a high standard of bidding practices in the construction industry. It provides for the reception of sealed bids from subcontractors whereby the sanctity of bidding is protected and adequate time is provided for the General Contractor to compile bids completely and accurately. These procedures are in the best interest of owners, architects, engineers, contractors and subcontractors.

Whenever the word "Designer" is used throughout this text, it shall be understood to mean "engineer or architect." Additionally, whenever the word "subcontractor" is used throughout this text, it shall be understood to mean "material supplier" where applicable.

ELIGIBILITY

Any General Contractor, Subcontractor, Designer or Owner may use the facilities of the Bid Depository, regardless of membership in any association or geographic location, provided the conditions and regulations established by the Depository are followed.

SCOPE

The Bid Depository shall accept and transmit bids for those trades named in the project manual.

MANAGEMENT

The Depository will be operated and managed by the Associated General Contractors of Maine, Inc. in accordance with these General Conditions and Regulations.

DEPOSITORY FEE

The fee for each use of the Depository shall be fifty dollars ($50.00), payable by the designer to the Maine Construction Bid Depository.

ADVISORY COMMITTEE

A Bid Depository Advisory Committee shall be maintained to provide project owners and awarding authorities with advice and counsel relative to matters concerning the administration of the Bid Depository filed bid system.

The Committee shall consist of two (2) architects, two (2) engineers, two (2) subcontractors and two (2) general contractors, all to be selected by the AGC Building Specifications Committee, after consultation with MAIA, CEM, ASAM, and ABC. Two (2) at-large members shall be selected by the Committee, once formed.

The Chair shall be chosen by the Committee members, but the Chair shall alternate bi-annually between a general contractor and a subcontractor.

Meetings of the Advisory Committee shall be called, as necessary, by the Chair or by a quorum of the Committee membership. A quorum shall consist of any three members of the Committee.

RECOMMENDED CLOSING TIME FOR BIDS

All subcontractors bids are to be received by the Depository not later than 3:00 PM and not less than six (6) calendar days prior to the closing of the General Contractor bid as prescribed by the Designer in the bid call and in the Instruction to Bidders. Bids received after the prescribed closing time shall be stamped and returned unopened by the Depository.

Recommended closing dates for the Bid Depository are Tuesday, Wednesday and Thursday, except when such date follows a statutory holiday.

PROCEDURE FOR SUBMITTING BIDS

All bids should be placed in official envelopes and on official forms obtained from the Bid Depository or Designer. Three types of official envelopes should be used:

LARGE WHITE envelopes swill contain the following small envelopes:

a) PINK envelope is for the General Contractor and will contain a complete formal bid.

b) GREEN envelope is for the Depository and will contain a copy of the bid, listing those General Contractors intentionally omitted, if any.

c) The BID BOND, if required, should be enclosed in the large white envelope, separate from the pink and green envelopes.

Each filed sub bid shall include only those sections or combined sections which are required by the Designer, including all addenda issued from the Designer's office 72 hours prior to sub bid closing time. Sub bids in any other form will be rejected by the Owner.

PROCEDURE TO BE FOLLOWED BY DESIGNERS

Designers shall insert in their specifications: "Sealed bids of subcontractors shall be filed in official envelopes and on official forms and deposited with the Bid Depository at the AGC office, Whitten Road, Box N, Augusta, Maine, no later than 3:00 PM (date). No bids will be accepted by the Depository after that time. The sections of work that must be filed with the Depository are: (list here the section(s) or combinations of sections, by section title and number)."

Designers shall clear the closing date with the Depository.

Addenda affecting sub trades filed with the Depository shall be issued from the Designer's office to all firms holding full or partial sets of plans, no later than 72 hours prior to sub bid closing time.

PROCEDURE TO BE FOLLOWED BY SUBCONTRACTORS

On or before the time specified by the Designer in the Instruction to Bidders, Subcontractors shall deliver their sealed bids to the Depository as follows:

A WHITE ENVELOPE SHALL CONTAIN:

a) Individual sealed PINK envelopes containing a bid proposal to each General Contractor concerned, on official forms.

b) A GREEN envelope for the Depository which will contain a copy of the bid, listing those General Contractors intentionally omitted, if any.

c) A BID BOND, if required, should be enclosed separately from the pink and green envelopes.

When requested, receipts shall be given for each WHITE envelope when deposited. Subcontractors may mail their sealed bids to the Depository, but they do so at their own risk.

Subcontractors are responsible for reading the general conditions and the specifications thoroughly and must submit their bid in accordance with the bid document. The responsibility for checking with the Designer on the existence of addenda and the content of same, rests solely with the subcontractor. Failure of the Subcontractor to acknowledge addenda may result in the disqualification of Subcontractor's bid.

When a Subcontractor has missed bidding to a General Contractor, and if that Subcontractor wishes to bid to that General Contractor:

1. The Subcontractor shall, not later than 24 hours prior to the closing date for the General Contractor, notify the Bid Depository, in writing, as follows: "We missed bidding to (Black Construction) on (ABC High School). Please consider our bid address to (White Construction) as if it were submitted to (Black Construction)."

2. The Subcontractor shall, after notifying the Bid Depository, advise (Black Construction).

Any General Contractor wishing to use its own forces for filed sub bid work, shall follow General Contractor procedures listed later in these regulations.

PROCEDURE TO BE FOLLOWED BY THE BID DEPOSITORY

Each Depository box shall clearly designate the project, and the date and time of closing as stated by the Designer in the bid documents. When large WHITE envelopes are presented for deposit prior to closing, they shall be stamped by a time clock showing the day, hour and minutes received and placed in the Depository box. A receipt noting the number of the envelope will be handed to the firm representative when requested.

Late bids will be time stamped and returned unopened by an official representative of the Depository. The PINK envelopes will be picked up by the General Contractor or a duly authorized representative. The Depository may require the General Contractor or representative to sign for envelopes when received. The Depository may mail envelopes to the General Contractor at General Contractor's request, risk and expense.

The GREEN envelopes shall be forwarded by the Depository to the Designer unless otherwise directed.

If bid bonds are required, they shall be forwarded by the Depository with the GREEN envelopes.

AMENDMENTS TO BIDS

Written amendments to Subcontractor bids which have been properly filed may be submitted to the Bid Depository provided that such amendments are received prior to the sub bid closing time, and provided further that if the amendment discloses the amount of the subcontract price submitted, the proposal will be declared VOID.

WITHDRAWAL OF BIDS

Verified requests from Subcontractors for withdrawal of bids will be accepted up to the time of sub bid closing. Following the time of sub bid closing, no such request will be considered until after the opening of the general contract bids.

PROCEDURES FOR GENERAL CONTRACTORS

A General Contractor intending to use its own forces or a subsidiary company for one or more complete trade sections, shall deposit its bid in accordance with the Regulations of the Bid Depository even if

General Contractor bids only to self. Such bid shall include a statement of the General Contractor's qualifications to perform the work.

The General Contractor should notify the Bid Depository of its intentions to bid a particular job. General Contractor should also advise Subcontractors that General Contractor is bidding in order to assure that a price is received for each filed trade.

The General Contractor, when submitting its bid, will name General Contractor's Subcontractors, with a separate price carried for each trade, which must correspond with the copy received by the Depository.

Any proposal submitted by a General Contractor with a proposal for Subcontractor's work which contains a price different from the proposal filed by that Subcontractor, shall have the proposal amount filed substituted for the proposal amount carried and the proposal of the General Contractor shall be adjusted by the difference prior to the selection of the General Contractor.

INFORMATION FOR THE DESIGNER

For the convenience of the Designer, the Bid Depository will provide, on request, information concerning scheduled bid closing to avoid conflicts at peak closing periods.

COMPLAINTS

Formal complaints relative to the administration of the filed bid system must be submitted, in writing, to the project owner or awarding authority, with a copy of the complaint submitted to the project designer. Upon receipt of the complaint, the owner or awarding authority may, before responding to the complaint, seek advice and counsel from the Bid Depository Advisory Committee, by contacting the committee through the AGC office at 622-4741.

SECTION 00300

Proposal Form - Long Form

BIDDER: _____

_____

_____

Board of Trustees
University of Maine Portland
c/o Mr. Dana A. Gray
Manager, Engineering and Architectural Services
Facilities Management, University of Southern Maine
96 Falmouth Street
P.O. Box 9300
Portland, ME 04104-9300

Having carefully examined the form of contract, general conditions and plans and specifications contained therein for Glickman Library, University of Southern Maine, as well as the premises and conditions affecting the work, we the undersigned propose to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this contract for the sum of _____ Dollars ($_____).

Alternate prices as follows:

Alternate #1	Doors @ Special Events	Add: _____
Alternate #2	Sprinkler Heads	Add: _____
Alternate #3	Lighting Retrofit	Add: _____
Alternate #4	Mechanical Boiler	Add: _____
Alternate #5	Millwork	Add: _____
Alternate #6	Passenger Elevator	Add: _____
Alternate #7	Temperature Controls	Add: _____
Alternate #8	Gas Booster	Add: _____
Alternate #9	2nd Floor HVAC	Add: _____

Unit Prices: The undersigned agrees to provide additional work as ordered or to allow for work ordered omitted in accordance with the following Unit Prices. Unit Prices will be applied to the net change in final quantities of work involved. The deduct price will be 100% of the add.

1. Electrical Duplex Outlet Box - per box. $ _____

2. Voice/Data Outlet Box - per box. $ _____

This proposal includes the cost of 100% Performance Bond plus 100% Payment Bond.
The receipt of the following addenda to plans and specifications is hereby acknowledged:

ADDENDUM # _____ DATED _____ ADDENDUM # _____ DATED _____
ADDENDUM # _____ DATED _____ ADDENDUM # _____ DATED _____
ADDENDUM # _____ DATED _____ ADDENDUM # _____ DATED _____

Any material or materials not specified in the bidding document but worthy of consideration may be introduced by the bidder by a separate letter attached to this Proposal. A cost comparison must be included giving the comparison with the Material specified and the reason for the suggested substitution. The basic bid shall be as specified.

Filed Subcontract Proposals as follows: (List those trades required, but do not combine trades except as called for).

Specification Division	Subcontractor Name	Amount
Division 13 – Fire Protection		
Division 14 – Elevators		
Division 15 – Mechanical (excluding Section 15950 "Testing Adjusting & Balancing")		
Division 16 - Electrical		

The undersigned agrees that each of the above named Subcontractors represents a bona fide Subproposal based on the Plans and Specifications and will be used for the Work indicated at the Amount stated, unless a substitution is made by mutual agreement as provided for in Section 00120, "Supplemental Instruction to Bidders". In the event Alternate Prices are requested and various trades are involved, the General Contractor may use properly filed Subproposals even though a change in Subcontractors because of Alternates, the General Contractor shall use supplemental sheets attached to the Proposal Form to indicate such changes.

The undersigned agrees, if this proposal is accepted to sign a contract and deliver it, along with the bonds and affidavits for all insurance specified within twelve (12) calendar days after the date of notification of such acceptance, except if the 12th day falls on a Saturday, Sunday or holiday, then the conditions will be fulfilled if the required documents are received before 12 o'clock noon on the day following the holiday,

or the Monday following the Saturday or Sunday, and as a guarantee thereof, herewith submits a bid bond as required.

The undersigned agrees, if awarded the Contract, to complete the work on March 12, 2004. The undersigned also agrees, if awarded the Contract, that no more than 90% of the contract amount will be sublet to other contractors.

Signed

By

P. O. Address

NOTE: If bidder is a corporation, write State of Incorporation, and if a partnership, give full names of all partners.

SECTION 00310

Maine Construction Bid Depository Proposal Form for Subcontractor

TO:_____

_____

For green envelope copy, list any general contractor(s) excluded from your bid

PROJECT:

Section(s) Quoted:

Price Quoted: $_____

(_____)

(written figures)

UNIT PRICES (if applicable)

Item _____ Amount $_____

_____

A. The undersigned proposes to furnish all labor and materials required for completing in accordance with the hereinafter described plans, specifications, general conditions and addenda, all the work specified in the above stated section(s) of the specifications and contract drawings dated

_____, prepared by _____,Architect/Engineer

B. Alternate prices are submitted as follows: (Use separate sheets as necessary)

Alternate No._____ Add $_____ Delete $
Alternate No._____ Add $_____ Delete $
Alternate No._____ Add $_____ Delete $
Alternate No._____ Add $_____ Delete $
Alternate No._____ Add $_____ Delete $

C. The subcontractor proposal includes the following addenda to the drawings and specifications: (List addenda and issue date of each)

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

D. The undersigned agrees that if is selected as a Subcontractor, the Subcontractor will execute with the selected General Contractor a subcontract in accordance with the terms of the Subproposal, and furnish the General Contractor with a 100% Performance Bond and a 100% Payment Bond for the Subcontractor's portion of the work.

E. _____ License # (if applicable)

Company

Signed by _____ Date

Address

Street City State Zip

F. All foreign corporations intending to do business in Maine must comply with the provisions of 13A MRSA Chapter 12 and shall contact the Secretary of State for compliance.

SECTION 00410

Form of Bid Bond

KNOW ALL BY THESE PRESENTS, THAT WE, the undersigned, (**) as PRINCIPAL, and _____(***) as SURETY, are hereby held and firmly bound unto the Treasurer of the UNIVERSITY OF MAINE SYSTEM in the penal sum of for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this ____ day of _____, 20__.

The condition of the above obligation is such that whereas the Principal has submitted to a certain proposal, attached hereto and hereby made a part hereof, to enter into a contract in writing for the

NOW THEREFORE,

(a) If said proposal shall be rejected, or, in the alternate

(b) If said proposal shall be accepted and the Principal shall execute and deliver a contract in the form of contract attached hereto (properly completed in accordance with said proposal) and shall furnish a bond for faithful performance of said contract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said proposal, then this obligation shall be void, otherwise the same shall remain in force and effect: It being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said surety and its bond shall be in no way impaired or affected by any extension of the time within which the principal may accept such proposal: and said surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

PRINCIPAL

By: _____ L.S.

SURETY

SURETY ADDRESS

By: _____ L.S.

(**) Insert Bidder's Name
(***) Insert Name of Surety

SECTION 00415

Form of Subcontractors Bid Bond

Know all by these presents, that we, the undersigned, (1)_____ (2) of
and State of _____, as Principal, and (3)_____, as Surety, are hereby held and firmly bound unto the Treasurer of the University of Maine System, as Obligee, in the penal sum of _____ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this (4)___ day of __, 20_.

The condition of the above obligation is such that whereas the Principal has submitted to the Obligee a certain subproposal, attached hereto and hereby made a part hereof, to enter into a subcontract in writing, for the construction of (5)_____ with any general contractor listed in said proposal, provided the designated general contractor has entered into a written contract with the owner.

Now therefore:

a. If said Subproposal shall be rejected, or in the alternate,
b. If said Subproposal shall be accepted and the Principal shall execute and deliver a subcontract to the general contractor designated by the Owner in the form of subcontract which shall be in conformance with the requirements of Article 35 of the Standard General Conditions for Contract Work (Section 00700) for this project, and shall furnish bonds for faithful performance of said subcontract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said subproposal, then this obligation shall be void, otherwise the same shall remain in force and effect: it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall in no way be impaired or affected by any extension of the time within which the principal may accept such proposal and said surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, the day and year first set above.

SIGNED AND SEALED this (4)_____ day of _____, 20__.

WITNESS:

_____

_____

_____

SUBCONTRACTOR:

By: _____ LS

By: _____ LS

By: _____ LS

WITNESS:

_____

_____

_____

SURETY:

By: _____ LS

By: _____ LS

By: _____ LS

Legend

(1) Correct Name of Subcontractor

(2) A Corporation, A Partnership, or an Individual, as the case may be

(3) Correct Name of Surety

(4) Same date as that of Subproposal

(5) Name of Project as designated in Bidding Documents

If Subcontractor is Partnership, all Partners should execute Bond. A Power of Attorney document, together with a statement that it still is in full force and effect shall be provided by the person executing this Bond. Bond must be countersigned by a Resident Maine Agent.

SECTION 00500

UNIVERSITY OF MAINE SYSTEM

Contract Agreement - Long Form

THIS AGREEMENT made the _____ day of _____, 20 ____, by and between the University of Maine System, Bangor, Maine, duly authorized and empowered by virtue of the laws of the State of Maine, hereinafter called the Owner, and
hereinafter called the Contractor.

WITNESSETH: That the Owner and the Contractor for the considerations hereinafter named agree as follows:

ARTICLE 1. SCOPE OF THE WORK

The Contractor shall furnish all of the materials and perform all of the work shown on the drawings and described in the Specifications entitled _____, prepared by _____, acting as and in these Contract Documents entitled the Architect and/or Engineer; and shall do everything required by this Agreement, the General Conditions and Special Provisions of the Contract, the Specifications and the Drawings.

ARTICLE 2: TIME OF COMPLETION

The work to be performed under this Contract shall be substantially completed on or before _____.

ARTICLE 3: THE CONTRACT SUM

The Owner shall pay the Contractor for the performance of the Contract, subject to additions and deductions provided by approved change orders in current funds as follows: Dollars ($_____).

ARTICLE 4: CONTRACT BOND

The Contractor shall furnish the Owner the approved Contract Bonds (as per Article 28 of the Standard General Conditions) in the amount of 100% of the Contract sum.

ARTICLE 5: PROGRESS PAYMENTS

The Owner shall make payments on account of the contract as provided therein as follows: Each month 95% of the value, based on Contract prices of labor and materials incorporated in the work and of materials suitably stored at the site thereof up to the first day of that month, as certified by the Architect and/or Engineer.

The Owner may cause contractor to be paid such portion of the amount retained hereunder as deemed advisable. (See Article 24 of the Standard General Conditions).

ARTICLE 6: FINAL PAYMENT

Final payment shall be due 60 days after completion and acceptance of the work, provided the contractor has submitted evidence satisfactory to the Owner that all payrolls, material bills and other indebtedness connected with the work has been paid.

ARTICLE 7: THE CONTRACT DOCUMENTS

The General Conditions of the Contract, Instructions to Bidders, the Proposal, the Special Provisions, the Specifications and the Drawings, together with this agreement, form the Contract, and they are as fully a part of the Contract as if hereto attached or herein repeated. The following is an enumeration of the Specifications and drawings.

SPECIFICATIONS:

ADDENDA:

DRAWINGS:

The Owner and the Contractor hereby agree to the full performance of the covenants herein.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement in triplicate on the day and year first above written.

_____
(COMPANY)

WITNESS:

_____ By: _____
(TITLE)

UNIVERSITY OF MAINE SYSTEM

WITNESS:

By:

SECTION 00610

Contract Performance Bond _____

Bond No.

KNOW ALL BY THESE PRESENTS THAT (1)_____(2)_____ _____of _____and State of _____, as PRINCIPAL, and (3) _____ _____, a corporation duly organized under the laws of the State of _____ and having a usual place of business in _____, as SURETY, are held and firmly bound unto the University of Maine System in the sum of _____Dollars ($_____), to be paid said Treasurer of the University of Maine System, or successor in office, for which payment well and truly to be made, Principal and Surety bind themselves, their heirs, executors and administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal shall promptly and faithfully perform the Contract entered into on the (4)____ day of _____, A.D., 20__ for the construction of (5)_____ _____ then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the University of Maine System .

Signed and sealed this (4)_____day of _____, 20__.

WITNESSES:	SIGNATURES:
_____	_____ LS
_____	_____ LS
_____	_____ LS

Bonding Company Agent:

Company: _____

Street: _____

City, State, Zip: _____

Telephone: _____

(1) Correct name of Contractor
(2) A corporation, a partnership, or an individual, as the case may be.
(3) Correct name of Surety
(4) Same date as that of contract.
(5) Name of Project as designated in contract.

If Contractor is partnership, all partners should execute bond. A Power of Attorney document, together with a statement that it still is in effect shall be provided by the person executing this bond. Bond must be countersigned by a Resident Maine Agent.

SECTION 00620

Contract Payment Bond _____

Bond No.

KNOW ALL BY THESE PRESENTS THAT (1)_____(2)_____ _____ of_____and State of _____, as Principal, and (3)_____, a corporation duly organized under the laws of the State of _____, and having a usual place of business in _____, as Surety, are held and firmly bound unto the University of Maine System in the sum of _____Dollars ($_____) for the use and benefit of claimants* as herein below defined, for the payment whereof Principal and Surety bind themselves, their heirs, executors and administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the Principal in connection with the work contemplated in the Contract entered into on the (4)_____ day of _____, A.D., 20__, for the construction of (5)_____, and shall fully reimburse the obligee for all outlay and expense which said obligee may incur in making good any default of said principal, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

*A Claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the contract.

Signed and sealed this (6)_____ day of _____, 20__.

WITNESSES:	SIGNATURES:
_____	_____ LS
_____	_____ LS
_____	_____ LS

Bonding Company Agent:

Company: _____

Street: _____

City, State, Zip: _____

Telephone: _____

(1) Correct name of Contractor
(2) A corporation, a partnership, or an individual, as the case may be.
(3) Correct name of Surety
(4) Same date as that of contract.
(5) Name of Project as designated in contract.
(6) Same date as that of Contract. If contractor is partnership, all partners should execute bond.

A Power of Attorney document, together with a statement that it still is in effect shall be provided by the person executing this bond. Bond must be countersigned by a Resident Maine Agent.

UNIVERSITY OF MAINE SYSTEM

Standard General Conditions - Long Form

For

Contract Work

SECTION 00700

INDEX TO ARTICLES OF GENERAL CONDITIONS

Article 1 Definitions

Whenever the following terms are used in these specifications or the contract, the intent and meaning shall be interpreted as follows:

Architect: The Project Architect and/or Engineer whose name appears on the drawings and/or specifications for the project, acting directly or through a duly authorized representative.

Bid Security: The security designated in the proposal, furnished by the bidder as a guarantee of good faith to enter into a Contract with the University, if the Contract be awarded to the bidder.

Bidder: Any individual, partnership, or corporation submitting a bid for the performance of the work under the terms of the contract, and acting directly or through a duly authorized representative.

Calendar Days: Consecutive Days, as occurring on a calendar, without regard to the day of the week, month, year, or Religious, National or Local holiday.

Change Order: A written agreement between the Owner and the Contractor, operating as a supplement to the Contract, covering correction of: omissions, errors, and discrepancies between the plans and the proposal or estimates; or any alterations in the plans; or additional requirements; work, materials, and incidentals required to complete the construction of the project in an acceptable manner, and setting forth the basis of compensation, if any. Before any Change Order modifies or becomes a part of the Work, it must be duly signed by the Contractor, Owner, and the Architect.

Contract: A written Agreement between the Owner and Successful Bidder, by which the Contractor is bound to perform the Work specified, in accordance with Plans, Specifications, General Conditions, and Special Provisions, which are a part of the Contract Documents, together with all Supplemental Agreements by which the Owner is bound to compensate the Contractor at mutually established and accepted rates or prices.

Contract Bond: The approved Forms of security furnished by the Contractor and the Contractor's Surety, or Sureties, guarantees the faithful performance of all the terms of the contract and the payment of all bills, for Labor, Materials, and Equipment by the Contractor.

Contract Document: The Contract Documents consist of the Contract, General Conditions, Special Provisions, the Plans, Specifications, including all Addenda and all other modifications thereof incorporated in the documents before their execution. These form the Contract.

Contractor: The individual, partnership, or corporation undertaking the execution of the work under the terms of the contract with the Owner, and acting directly or through a duly authorized representative.

Final Completion Date: The date when all contract requirements have been fulfilled by the Contractor.

Owner: The University of Maine System, acting through its duly authorized representative.

Plans: All official Drawings or Reproductions of Drawings pertaining to the Work provided for in the Contract and such Working Plans as may be furnished or approved by the Owner or Architect from time to time.

Project: The entire improvement proposed by the Owner to be constructed in part or in whole pursuant to these Specifications and Contract Documents. Where the word "Job" or "Work" appears, it shall mean the Project.

Proposal or Bid: The written offer of the Bidder, on a Form prescribed to perform the Work specified.

Provide: The word "provide" shall mean furnish and install, including connections to services, if required, unless specified otherwise.

Resident Inspector: The Authorized Representative of the Architect.

Subcontractor: The Individual, Firm or Corporation undertaking the execution of a part of the Work under the terms of the Contract by virtue of a written Agreement between the individual, firm or corporation and the Contractor.

Superintendent: The Representative of the Contractor, authorized by the Contractor to receive and fulfill instructions from the Architect.

Substantial Completion Date: The date when the project is sufficiently complet in accordance with the contract documents, as modified by approved Change Orders, so that the University of Maine System can occupy the project for the purpose for which it was intended.

Supplemental Agreement: A supplemental agreement is any agreement entered into between the Contractor and the Owner with or without the approval of the Architect subsequent to the execution of the Contract.

Surety: The Individual, Partnership, or Corporation which is bound with and for the Contractor to insure the Contractor's faithful performance of the Contract and for the Contractor's payment of the bills for Labor, Materials and Equipment by the Contractor.

Work: See Project.

Article 2 Intent, Correlation and Execution of Documents

The intent of the contract Documents is to prescribe a complete work or improvement. The Plans, including all revisions, the General Conditions for Contract Work, the Special Provisions, Instructions to Bidders, the Proposal, Contract, Contract Bond, and all other sections of the specifications, including all addenda, all dated and on file in the Office of Facilities prior to the time set for receiving bids, and as prepared by the Architect, shall each become a part of the Contract Documents, and all proposals must be based on a full compliance therewith. Any Supplemental Agreements entered into subsequent to the Contract will also become a part of said Contract.

The Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of the documents is that, UNLESS OTHERWISE SPECIFIED, the Contractor shall furnish all labor, materials, equipment, items, articles, tools, transportation, insurance, services, necessary supplies, operations or methods, and incidentals that may be reasonably required to construct and complete the project, facility or improvement in a manner necessary for the proper execution of the Work. Any deviations from the Plans which may be required by the exigencies of the construction, or because of error, will in all cases, be determined by the Architect, and authorized in writing subject to approval by the Owner. Materials or Work described in words which so applied have a well known technical or trade meaning shall be held to refer to such recognized standards. Since the Plans and Specifications cover the dimensions and features of the Work and do not set forth the analysis of the design, it is the duty of the Contractor fulfilling them to ascertain the true intent in any case where it is doubtful.

Work not covered under any heading, section, branch, class or trade of the Specifications, shall not be supplied unless it is shown on Drawings or is reasonably inferable therefrom as being necessary to produce the intended results.

The Contractor shall take no advantage of any apparent error or omission in the Plans and Specifications, and the Architect shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the Plans and Specifications. Where errors or omissions appear in the Contract Documents, the Contractor shall promptly notify the Architect in writing of such errors or omissions. Inconsistencies in the Contract Documents are to be reported before Proposals are received, whenever found.

The Contractor shall, upon acceptance of a Contract and before commencing Work, contact the Architect and request a

pre-construction conference. The purpose of this conference shall be as follows:

1) To introduce the members of the Architectural firm and the representative of the Owner and define their responsibilities in connection with this Project.

2) To emphasize any Special Provisions applicable to the Project.

3) To establish the Work Progress Schedule and set up procedure for prompt review of all shop drawings required.

4) To provide the Contractor with opportunity to discuss points of doubt and any apparent inconsistencies noted in the Plans and Specifications before proceeding to purchase Material or execute the Work.

During the further progress of this Work, monthly meetings will be held to review the Work Progress Schedule and the general progress and any other questions which might affect the execution of this contract.

Article 3 Detail Drawings and Instructions

The Architect shall furnish, with reasonable promptness, additional instructions by means of Drawings or otherwise, necessary for the proper execution of the Work. All such Drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom.

The Work shall be executed in conformity therewith and the Contractor shall do no Work without proper Drawings and instructions.

Immediately after being awarded the Contract, the Contractor shall prepare an estimated Progress Schedule and submit same for Architect's approval. It shall indicate the dates for the starting and completion of the various stages of construction.

Article 4 Copies Furnished

Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, all copies of Drawings and Specifications reasonably necessary for the execution of the Work.

Article 5 Shop Drawings

The Contractor shall check and verify all field measurements and shall submit with such promptness as to cause no delay in the Contractor's own work or in that of any other Contractor, all shop or setting drawings and schedules require d for the work of the various trades. All shop or setting drawings and schedule s shall be checked by the Contractor prior to submission to the Architect. Unless otherwise specified, shop or setting drawings and schedules shall be submitted in seven copies. The Architect shall check and review, with reasonable promptness, such schedules and drawings only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor shall make any corrections required by the Architect, file with the Architect seven corrected copies and furnish such other copies as may be needed. The Architect's review of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from drawings or specifications, unless the Contractor has in writing called the Architect's attention to such deviations at the time of submission, and secured the Architect's written approval, nor shall it relieve the Contractor from responsibility for errors in shop drawings or schedules.

Article 6 Drawings and Specifications on the Work

The Contractor shall keep one copy of all Drawings and Specifications on the Work, in good order, available to the Architect, the Architect's Representative, and the Owner.

Article 7 Ownership of Drawings

All drawings, Specifications and copies thereof furnished by the Architect are the Architect's property. They are not to be used on other Work, and, with the exception of the signed Contract set, are to be returned to the Architect on request, at the completion of the Work.

Article 8 Samples

The Contractor shall furnish for approval, with reasonable promptness, all samples as directed by the Architect. The Architect shall check and approve such samples with reasonable promptness, only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The work shall be in accordance with approved samples.

Article 9 Materials, Appliances, Employees

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation and facilities necessary for the execution and completion of work.

Whenever an article or material is defined by describing a proprietary product, or by using the name of a manufacturer, the term "or approved equal", if not inserted, shall be implied. The specific article or material mentioned shall be understood as establishing minimum standards as to the type, function, standard of design, durability, efficiency and quality desired and shall not be construed so as to exclude other manufacturer's products of comparable quality, design, and efficiency.

Materials and models of items which the Contractor alleges to be equal to the materials and methods of items named in the specifications, shall be subject to the written approval by the Architect/Engineer. The use of alternate items will not be permitted without the approval of the Owner and Architect. All approved substitutions shall be in writing and approved by the Architect. The Contractor shall not be relieved from the responsibility of furnishing Articles or Mate rials equal in quality, design and efficiency to those specified because of the approval of such alternate items by the Architect. The Architect's approval or rejection of a proposed substitution may be based on any of the previous considerations, and the Architect's decision may or may not express reasons for rejection, and shall be final. Requests for substitutions shall originate and be submitted by the Contractor, not a Subcontractor. The material or equipment shall be sufficiently described to enable the Architect to easily identify the salient features. Proposed substitutions which require redesign of a product or system shall not be considered unless the Contractor agrees to pay the redesign cost or the credit to the Owner for the substitution exceeds the cost of redesign, in which case, the Owner will pay the cost of redesign.

The Contractor shall guarantee the Contractor's work against any defects in workmanship and materials for a period of one year from the date of the written acceptance of the project.

Materials and Equipment shall be new, free from defects, perfect and complete, unless otherwise stipulated. Materials or equipment specified or shown on the Drawings shall be applied or installed according to the directions of the manufacturer, or the recommendations of an association dealing primarily with the Material, unless specifically designated otherwise. The scope of the direction furnished shall include the application of experienced personnel to each trade involved. In no case shall the installation be below the standard recommended by the manufacturer or association.

The Contractor shall be responsible to the Owner for the suitability of Mate rials and Equipments furnished to comply fully with the Specification.

The Contractor shall pay promptly all the Contractor's employees as their pay falls due, shall pay promptly as they fall due all bills for material, supplies and services going into the work, and all bills for insurance, Worker's Compensation coverage, Federal and State Unemployment Compensation, and Social Security charges applicable to said project. Before final settlement is made, the Contractor shall furnish to the Owner affidavits that all said payments have been made.

The Contractor shall at all times enforce strict discipline and good order among the Contractor's employees, and shall not employ on the Work any unfit person or anyone not skilled in the work assigned to him.

Article 10 Royalties and Patents

The Contractor shall, for all time, secure to the Owner the free and undisputed right to the use of any and all patented articles or methods used in the work and shall defend at the Contractor's own expense any and all suits for infringement or alleged infringement of such patents, and in the event of adverse award under patent suits, the Contractor shall pay such awards and hold the Owner harmless in connection with any patent suits that may arise as a result of installations made by the Contractor and as to any awards made thereunder.

Article 11 Surveys, Permits, Laws, Taxes and Regulations

Interpretations of this contract shall be governed by the laws of the State of Maine.

The Owner shall furnish all surveys unless otherwise specified.

Permits and licenses necessary for the prosecution of the work shall be secured and paid for by the Contractor. Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the drawings and specifications are at variance therewith, the Contractor shall promptly notify the Architect in writing and any necessary changes shall be adjusted as provided in the Contract for changes in the work. If the contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect, the Contractor shall bear all costs arising therefrom.

The University of Maine System is exempt from the payment of Federal Excise Taxes on articles not for resale and for the Federal Transportation Tax on all shipments. The Contractor and Subcontractor shall quote less these taxes. Upon application, exemption certificates will be furnished when required. The University of Maine is exempt from the payment of Maine State Sales and Uses Taxes. The Contractor and Subcontractors shall quote less these taxes.

In execution of the Contract, the Contractor and all subcontractors agree to be aware of and to comply with the requirements and regulations of the Americans with Disabilities Act of 1990 (42 U.S.C. §12101 et. seq.).

Article 12 Labor and Wages

All Contractors and Subcontractors shall conform to the labor laws of the State of Maine, and all other laws, ordinances, and legal requirements affecting the work in Maine.

If a wage scale prepared by the State of Maine Department of Labor, Bureau of Labor Standards, is included in the Contract Documents, such wage scale represents the minimum wages that must be paid to each category of labor employed on the project.

In the employment of Laborers, preference shall first be given to residents of the State who are qualified to perform the work to which the employment relates, and, if they cannot be obtained in sufficient numbers, then to citizens of the United States.

Article 13 Condition and Care of Site and Protection of the Work

The Contractor shall continuously maintain adequate protection of all of the Contractor's work from damage and shall protect the property from injury or loss arising in connection with this Contract, and shall make good any such damage, injury or loss. The Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

The Contractor shall take all necessary precautions for the safety of employees on the Work, and shall comply with all applicable provisions of Federal, State, and Municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling materials; and the Contractor shall designate a responsible member of the Contractor's organization on the Work, whose duty shall be the prevention of accidents. The name and position of any person so designated shall be reported to the Architect by the Contractor.

The Contractor shall return all improvements on or about the site which are not shown to be altered, removed, or otherwise changed to the condition which existed prior to the start of Work on the Project. The Contractor shall protect all existing buildings, structures, or other features from damage by any operation in connection with the Project. Utilities encountered shall be protected and maintained in service until moved, or abandoned. The Contractor shall

exercise care in

the Contractor's work around such utilities as may be shown on the plot plan or otherwise found, which are not to be moved, replaced or abandoned.

The Contractor shall protect existing trees, and other features, which are to remain, from damage during grading, excavation, filling, trucking, etc. If necessary, tree trunks shall be boxed, and barricades set up at sufficient distance to prevent damage to major tree branches.

Should the Work or Material of this or any other Contractor employed by the Owner become damaged when reasonably protected, the same shall be replaced by the Contractor originally furnishing the same at the expense of the Contractor who caused the damage.

In an emergency affecting the safety of life or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Architect or Owner, is hereby permitted to act, at the Contractor's discretion, to prevent such threatened loss or injury. Any compensation claimed by the Contractor on account of emergency work, shall be determined by agreement.

Article 14 Inspection of Work

The Architect, the Architect's representatives, and the Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractor shall provide proper facilities for such access and for inspection.

If the Specifications, the Architect's instructions, laws, ordinances or any public authority require any work to be specially tested or approved, the Contractor shall give the Architect timely notice of its readiness for observation by the Architect or inspection by another authority, and if the inspection is by another authority, then the Contractor shall notify that authority of the date fixed for such inspection. Required certificates of inspection must be secured by the Contractor. Observations by the Architect shall be promptly made and, where practicable, at the source of supply. If any work should be covered up without approval or consent of the Architect, it must, if requested by the Architect, be uncovered for examination at the Contractor's expense.

Reexamination of questioned work may be ordered by the Architect, and, if so ordered, the work must be uncovered by the Contractor. If such work be found in accordance with the Contract Documents, the Owner shall pay the cost of reexamination and replacement. If such work be found not in accordance with the Contract Documents, the Contractor shall pay such cost, unless it be found that the defect in the work was caused by a Contractor employed as provided in Article 33, and in that event the Owner shall pay such cost.

The University of Maine System, through its Representatives, shall make periodical inspections of the Work during the course of construction and make such recommendations as may be indicated to the Architect or Engineer, when employed. The Architect or Engineer, when employed, shall provide adequate inspection of Materials, Equipment, Methods, and Changes in Plans on all projects designed by the Architect or Engineer.

The Architect, in conjunction with the Owner, will make a final inspection of all work included in the Contract or any portion thereof, as soon as possible after notification by the Contractor that such work is completed and ready for inspection, If such work is not acceptable at the time of the inspection, the Architect shall advise the Contractor in writing as to the particular defect s to be remedied before such work can be approved.

Article 15 Superintendence: Supervision

The Contractor shall keep on the work, during its progress, a competent Superintendent and any necessary assistants, all satisfactory to the Architect. The Superintendent shall not be changed except with the consent of the Architect , unless the Superintendent proves to be unsatisfactory to the Contractor and ceases to be in the Contractor's employ. The Superintendent shall represent the contractor in the Contractor's absence, and all directions given to the Superintendent shall be binding as if given to the Contractor. Important directions shall be confirmed in writing to the Contractor. Other directions shall be confirmed on written request in each case. The Architect shall not be responsible for the acts or omissions of the superintendent or the Superintendent's assist ants.

The Contractor shall give efficient supervision to the Work, using the best skill and attention. The Contractor shall carefully study and compare all Drawings, Specifications and other instructions and shall, at once, report to the Architect any error, inconsistency or omission which the Contractor may discover, but the Contractor shall not be liable

to the Owner for any damage resulting from any errors or deficiencies in the Contract Documents or other Instructions by the Architect.

Article 16 Changes in the Work

The Owner reserves the right to increase or decrease any or all of the items of work indicated in the plans, proposal and contract, or to eliminate any one or more of such items, without invalidating the contract. As the work progresses the Owner may make such alterations in the plans, in the character of the work, or in the specified coordination of two or more concurrent contracts, as may be considered necessary or desirable in order to complete the construction. Such changes shall in no-wise invalidate the contract. All such work shall be executed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change.

In giving instructions, the Architect shall have authority to make minor changes in the Work, not involving extra cost, and not inconsistent with the purposes of the Building or Project, but otherwise, except in an emergency endangering life or property, no Extra Work or change shall be made unless in pursuance of a duly signed Change Order.

Should the Contractor encounter during the progress of the work, latent conditions at the site materially differing from those shown on the drawings or in the specifications, or unknown conditions of an unusual nature differing materially from those already encountered in such work, the attention of the Architect shall be immediately called to such conditions before they are disturbed. The Architect shall promptly investigate the conditions and if they do so materially differ, the Contract shall, with the approval of the Owner, be modified by a Change Order to provide for any increase or decrease in cost resulting from such conditions.

Should such alterations be productive of increased unit cost, or result in decreased unit cost to the Contractor, a fair and equitable sum therefore shall be agreed upon in writing before such Work is begun and shall be added to or deducted from the Contract Amount, as the case may be, by means of a written Change Order. The Change Order shall state the nature of the change, the location, the itemized estimate of unit quantities, the basis for payment, and the reason for the change. Such Change Order is to be on approved forms.

When the Change Order has been properly signed by all parties and encumbered , it shall become a part of the Contract.

The value of any such Extra Work or change shall be determined in one or more of the following ways:

a) By estimate and acceptance in a lump sum;

b) By unit prices named in the contract or subsequently agreed upon;

c) By cost and percentage or by cost and a fixed fee.

If none of the above methods is agreed upon, the Contractor, if directed, shall proceed with the Work. In such case and also under case (c), the Contractor shall keep and present in such form as the Architect may direct, a correct account of the cost, together with vouchers. In any case, the Architect shall certify to the amount, including reasonable allowance for overhead and profit, due to the Contractor. Pending final determination of value, payments on account of changes shall be made on the Architect's certificate.

When the subparagraphs (a) and (c) above are used to determine the value of the Work, the allowance for overhead and profit combined, included in the total expense to the Owner, shall be based upon the following schedule;

For the Contractor, for any work performed by the Contractor's own forces, 20% of the cost;

For each Subcontractor, for work performed by the Subcontractor's own forces, 20% of the cost;

For the Contractor, for work performed by a Subcontractor, 10% of the amount due the Subcontractor.

Cost shall be limited to the following: Cost of materials, cost of delivery, cost of labor, including Social Security, Old Age and Unemployment Insurance (Labor cost may include a pro-rata share of foremen's time, only in case an extension of Contract Time is granted on account of the change); Worker's Compensation Insurance; Rental value of

power tools and equipment.

Overhead shall include the following: Bond Premiums, supervision, wages of time keepers, watchmen and clerks, small tools, incidentals, general office expense, and all other expenses not included in "Cost".

If the net value of a change results in a credit from the Contractor or Subcontractor, the credit given shall be the net cost without overhead or profit. The cost as used herein shall include all items of labor, materials, and equipment.

Article 17 Claims for Extra Cost

If the Contractor claims that any instructions by drawings or otherwise involve extra cost under this contract, the Contractor shall give the Architect written notice thereof within 10 days after the receipt of such instructions, and, in any event, before proceeding to execute the work, except in emergency endangering life or property, and the procedure shall then be as provided for changes in the work. No such claim shall be valid unless so made.

Article 18 Deductions for Uncorrected Work

If the Architect and Owner deem it inexpedient to correct work injured or done not in accordance with the Contract, an equitable deduction from the Contract price shall be made therefor.

Article 19 Delays and Extension of Time

If the Contractor be delayed at any time in the progress of the work by any act or neglect of the Owner or the Architect, or of any employee of either, or by any separate Contractor employed by the Owner, or by changes ordered in the work, or by strikes, lockouts, fire, unusual delay in transportation, unavoidable casualties or any causes beyond the Contractor's control, or by any cause which the Architect shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Architect may decide.

No such extension shall be made for delay occurring more than seven days before claim therefor is made in writing to the Architect. In case of a continuing cause of delay, only one claim is necessary.

If no schedule or agreement stating the dates upon which drawings shall be furnished is made, then no claim for delay shall be allowed on account of failure to furnish drawings and not then unless such claim be reasonable.

If, in the opinion of the Architect, progress of the work is such that the contract completion date cannot be met for causes other than those stated above, the Architect may request the Contractor to work additional men, additional hours, or both, or provide additional equipment. Costs of all such additional work shall be borne by the Contractor.

This article does not exclude the recovery of damages for delay by either party under other provisions in the Contract Document.

Article 20 Correction of Work

The Contractor shall promptly remove from the premises all Work condemned by the Architect as failing to conform to the Contract, whether incorporated or not, and the Contractor shall promptly replace and reexecute the Contractor's own Work in accordance with the Contract and without expense to the Owner and shall bear the expense of making good all Work of other Contractors destroyed or damaged by such removal or replacement. If the Contractor does not remove such condemned Work within a reasonable time, fixed by written notice, the Owner may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten days' time thereafter, the Owner may, upon ten days' written notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final payment, or from the date of the Owner's substantial usage or occupancy of the project, whichever is earlier, and in accordance with the terms of any special guarantees provided in the contract. The Owner shall give notice of observed defects with reasonable promptness. All questions arising under this Article shall be decided by the Architect, notwithstanding final payment.

Article 21 Owner's Right to do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this contract, the Owner, after three days' written not ice to the Contractor, may, without prejudice to any other remedy the Owner may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor, provided, however, that the Architect shall approve both such action and the amount charged to the Contractor.

Article 22 Owner's Right to Terminate Contract

If the Contractor should be adjudged a bankrupt, or if the Contractor should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency, or if the Contractor should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials or if the Contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Architect, or otherwise be guilty of a substantial violation of any provision of the Contract, then the Owner, upon the certificate of the Architect that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor, and the Contractor's surety, seven days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools and appliances thereon and finish the work by whatever method the Owner may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the contract price shall exceed the expense of finishing the work including compensation for additional architectural, managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be certified by the Architect.

Article 23 Contractor's Right to Stop Work or Terminate Contract

If the Work should be stopped under an order of any court, or other public authority, for a period of thirty days, through no act or fault of the Contractor or of anyone employed by the Contractor, then the Contractor may, upon seven days' written notice to the Owner and the Architect, terminate this Contract and recover from the Owner payment for all Work executed and any proven loss sustained upon any Plant or Materials and reasonable profit and damage.

Should the Architect fail to issue any certificate for payment, through no fault of the Contractor, within seven days after the Contractor's formal request for payment, or if the Owner should fail to pay to the Contractor within a reasonable time after presentation, any sum certified by the Architect, then the Contractor may, upon seven days' written notice to the Owner and the Architect, stop the Work or terminate this Contract as set out in the preceding paragraph.

Article 24 Payments

The Contractor shall, before the first application for payment, submit to the Architect, in triplicate, a "Contract Cost Breakdown", form for which is attached to, and becomes a part of, the Specifications. If required, this form shall be supported by such evidence as to its correctness as the Architect may direct, and unless found to be in error, shall be approved by the Architect and used as a basis for payments.

The Contractor shall submit to the Architect an application for each payment and, if required, receipts or other vouchers, showing the Contractor's payments for materials and labor, including payments to subcontractors as required by Article 35. Line items on requisition shall agree with line items on "Contract Cost Breakdown".

Application for payment as the work progresses may be made of the Owner, but no more often than once a month, unless due to unusual circumstances the Owner may approve more frequent payments. Said Requisition for Payments shall be based on the proportionate quantities of the various classes of work complete d or incorporated in the work in accordance with the Work Progress Schedule and the value thereof determined from the Contract Cost Breakdown. Payments, upon authorization of the Architect, may be made on account of materials not incorporated in the work but delivered and suitably stored at the site. Such payments shall be conditioned upon submission by the contractor of bills of sale, or such other procedure as will adequately protect the Owner's interest including applicable insurance.

In the event any Materials delivered, but not yet incorporated in the Work, have been included in any said "Requisition for Payment" and payment thereon made, and said materials thereafter deteriorate, become damaged or

destroyed, or for any reason, whatsoever, become unsuitable or unavailable for use in the Work, then the full amount allowed therefor in any previous "Requisition for Payment" shall be deducted from the gross value of any subsequent payment or final payment, unless the Contractor shall satisfactorily replace said Material.

At the preconstruction meeting, the Contractor and Owner shall establish the requisition cycle for the project. Based on this cycle, the Contractor shall prepare the "Contractor's Payment Requisition and Certification" form (Section 00850). An original plus three (3) copies shall be submitted to the Architect for review. Within seven (7) days, the Architect shall review the requisition and make a payment recommendation to the Owner. The Owner shall evaluate the recommendation and issue an appropriate payment to the Contractor within fourteen (14) days of receipt of the recommendation from the Architect.

No certificate issued, nor payment made to the Contractor, nor partial or entire use or occupancy of the Work by the Owner, shall be an acceptance of any Work or Materials not in accordance with this Contract. The making and acceptance of the final payment shall constitute a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty Work or Materials appearing within one year after final payment or from requirement of drawings or specifications, and of all claims by the Contractor, except those previously made and still unsettled.

The Owner shall retain five percent (5%) of each payment due the Contractor as part security for the fulfillment of the Contract by the Contractor. The Owner may, if deemed expedient to do so, cause the Contractor to be paid temporarily or permanently from time to time during the progress of the work such portion of the amount retained as the Owner deems prudent or desirable. In case such payments are made, the Owner may at any time withhold further payments until the full amount of the five percent (5%) is re-established, all in accordance with the provisions of Title 5, M.R.S.A. §1746, as amended.

Article 25 Payments Withheld

The Architect may withhold, or on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary in the Architect's reasonable opinion to protect the Owner from loss on account of:

a) Defective Work not remedied;
b) Claims filed or reasonable evidence indicating probable filing of claims;
c) Failure of Contractor to make payments properly to subcontractors for Material or Labor;
d) A reasonable doubt that the contract can be completed for the balance then unpaid;
e) Damage to another Contractor.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

Article 26 Contractor's Liability Insurance

The Contractor shall not commence work under this contract until the Contractor has obtained all insurance required under this paragraph and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on a subcontract until all similar insurance required of subcontractor has been so obtained and approved.

The Contractor and any Subcontractor shall purchase and maintain such insurance as will protect themselves from claims set forth below which may arise out of or result from the Contractor's or Subcontractor's execution of the work, whether such execution be by themselves or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

1. Claims under Workers' Compensation, disability benefit and other similar employee benefit acts;

2. Claims for damages because of bodily injury, occupational sickness or disease, or death of their employees;

3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than their employees;

4. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom;

5. Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle.

6. The Contractor shall secure and maintain an Owner's Protective Liability Policy naming the University of Maine System, 107 Maine Ave., Bangor, ME 04401-4380, as the named insured. Policy shall be filed with the University of Maine System, Office of Facilities, prior to the start of construction.

A. General Liability shall provide coverage for premises and operations, products and completed operations, contractual and personal injury liabilities. Coverage shall be provided on a standard Insurance Services Office Commercial General Liability Form CG0001 or comparable form.

General Liability shall be provided with the following minimum limits:

1.	General Aggregate	$2,000,000
2.	Products & Completed Operations Aggregate	$2,000,000
3.	Personal Injury Aggregate	$1,000,000
4.	Each Occurrence	$1,000,000

Property Damage Insurance will provide for Collapse and Underground Coverage. If applicable, Explosion Coverage shall be provided as well. Aggregate limits shall apply on a per location or job basis.

B. Workers' Compensation Coverage shall be provided on a statutory basis according to Maine Law and will apply to all personnel on the job site.

1. Employers Liability

Bodily injury by accident	$500,000 each accident
Bodily injury by disease	$500,000 each employee
Bodily injury by disease	$500,000 policy limit

C. Auto Liability Insurance shall cover all owned and hired vehicles as well as Employer's non-ownership liability.

1.	Limits - Combined Single Limit of Liability	$1,000,000

D. Owners Protective Liability — $2,000,000 aggregate limit
$1,000,000 occurrence limit

E. Certificates of Insurance acceptable to the owner shall be filed with the University of Maine System, Office of Facilities, prior to commencement of the Work. The Certificates of Insurance shall indicate the Certificate Holder as University of Maine system, 107 Maine Avenue, Bangor, Maine 04401, and shall contain a provision that coverage afforded under the above policies will not be cancelled or materially changed unless at least thirty (30) days prior Written Notice has been given to the Owner.

All coverage provided to comply with the Specifications shall be provided by companies licensed by the State of Maine Bureau of Insurance.

Article 27 Property Insurance

A. New Construction

The Contractor shall secure "All Risk" type Builder's Risk Insurance for work to be performed. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than the initial contract award amount. The policy shall cover not less than the losses due to fire, explosion, hail, lightening, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the contract time, and until the work is accepted by the Owner. The policy shall name as the insured the Contractor, the Subcontractors, the Architect and the Owner. The policy must include endorsement providing "permission to occupy in advance of project completion." Copies of the Certificate of Insurance shall be forwarded to the Architect and the Owner prior to starting any work at the site.

B. Major Renovations and/or Additions to Existing University System Buildings

Coverage will be provided by the State/University System by means of an addition to the existing State fire insurance schedule. The University of Maine System shall notify the Maine Risk Management Division concerning the project, including the value of the work and the name of the General Contractor. Coverage shall include the Contractor's and all Subcontractor's, as their interests may appear. A certificate of insurance will be furnished to the General Contractor, if requested. (Note: This coverage is limited to exposures protected under the basic State/University System fire insurance policy which covers fire, extended coverage, difference in conditions, vandalism and malicious mischief with a $10,000.00 deductible. The deductible amount is the responsibility of the Contractor.) Any other insurance desired by the Contractor for exposures beyond that provided by the State/University System policy will be the responsibility of the Contractor.

C. Minor Renovations and/or Additions to University System Buildings

While no specific addition to the fire schedule will be required, the University of Maine System shall notify the Maine Risk Management Division concerning the project, including the name of the General Contractor or any Subcontractor so that coverage may be provided as their interests may appear. (Note: This coverage is limited to exposures protected under the basic State/University System fire insurance policy which covers fire, extended coverage, difference in conditions, vandalism and malicious mischief with a $10,000.00 deductible. The deductible amount is the responsibility of the Contractor.) Any other insurance desired by the Contractor for exposures beyond that provided by the State/University System policy will be the responsibility of the Contractor.

Article 28 Contract Bonds

The Contractor shall furnish to the University System upon execution of the Contract, a Contract Performance Bond and a Contract Payment Bond each for the full amount of the Contract sum and issued by a surety company or surety companies authorized to do business in the State of Maine and as approved by the Owner. The Bonds shall be in accordance with and executed on the forms furnished in the specifications. The Bonds shall allow for any additions or deductions to the Contract.

The Contract Bonds shall continue in effect for one year after final acceptance of each Contract to protect the Owner's interest in connection with the one year guarantee of Workmanship and Materials and to assure settlement of claims for the payment of all bills for Labor, Materials, and Equipment by the Contractor.

Article 29 Damages

A. The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (b) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

B. In any and all claims against the Owner or the Architect or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph A, above, shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under worker's compensation acts, disability benefit acts or other employee benefit acts.

C. The obligations of the Contractor under Paragraph A, above, shall not extend to the liability of the Architect, the Architect's agents or employees arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, the Architect's agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

Article 30 Liens

Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Owner a complete release of all liens arising out of this Contract, or receipts in full in lieu

thereof, and, if required in either case, an affidavit that so far as the Contractor has knowledge or information, the releases and receipts include all the lab or and material for which a lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the Owner, to indemnify the Owner against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

Article 31 Assignment

Neither party to the Contract shall assign the Contract or Sublet it as a whole without the written consent of the other, nor shall the Contractor assign any monies due or to become due to the Contractor hereunder, without the previous written consent of the Owner.

Article 32 Mutual Responsibility of Contractors

Should the Contractor cause damage to any separate Contractor on the Work, the Contractor agrees, upon due notice, to settle with such Contractor by Agreement or Arbitration, if the separate Contractor will so settle. If such separate Contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgment against the Owner arises therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

Article 33 Separate Contracts

The Owner reserves the right to let other contracts in connection with this Work under similar General Conditions. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their Materials and the execution of their Work and shall properly connect and coordinate the Contractor's Work with theirs.

If any part of the Contractor's Work depends for proper execution or results upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Architect any defects in such Work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of other Contractor's Work as fit and proper for the reception of the Contractor's Work, except as to defects which may develop in other Contractor's Work after the execution of the Contractor's Work.

To insure the proper execution of subsequent Work, the Contractor shall measure Work already in place and shall at once report to the Architect any discrepancy between the executed Work and the Drawings.

Article 34 Subcontracts

The Contractor shall submit in writing to the Architect for approval a complete list with the names of all particular Subcontractors to whom the Contractor proposes to sublet work. The Subcontractors named shall be reputable firms of recognized standing with a record of satisfactory Work. The Contractor shall not employ any Subcontractor or use any Material until they have been approved, or where there is reason to believe the Work will not be accomplished in accordance with the Contract Documents. The complete list of Subcontractors and Materials must be submitted for approval to the Architect and Owner.

The Architect shall, on request, furnish to any Subcontractor, wherever practicable, evidence of the amounts certified on the Subcontractor's account.

The Contractor agrees that the Contractor is as fully responsible to the Owner for the acts and omissions of subcontractors, and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by the Contractor.

Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the Owner.

Article 35 Relations of Contractor and Subcontractor

The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Contract Documents, the Drawings and Specifications as far as applicable to the Contractor's Work, including the

following provisions of this article, unless specifically noted to the contrary in a Subcontract approved in writing as adequate by the Owner or Architect.

The Subcontractor agrees:

A. To be bound to the Contractor by the terms of the Contract Documents, Drawings, and Specifications, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes towards the Owner.

B. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment as specified.

C. To make all claims for extras, for extensions of time and for damages for delays or otherwise, to the Contractor in the manner provided in the General Conditions for like claims by the Contractor upon the Owner, except that the time for making claims for extra cost is one week.

The Contractor agrees:

D. To be bound to the Subcontractor by all the obligations that the Owner assumes to the Contractor under the Contract Documents, Drawings, and Specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the Owner.

E. To pay the Subcontractor, upon the payment of certificates, the amount allowed to the Contractor on account of the Subcontractor's Work to the extent of the Subcontractor's interest therein.

F. To pay the Subcontractor, upon the payment of certificates, if issued otherwise than as in E, so that at all times the Subcontractor's total payments shall be as large in proportion to the value of the Work done by the Subcontractor as the total amount certified to the Contractor is to the value of the Work done by the Contractor.

G. To pay the Subcontractor to such extent as may be provided by the Contract Documents or the Subcontract, if either of these provide for earlier or larger payments than the above.

H. To pay the Subcontractor on demand for the Subcontractor's Work or Materials as far as executed and fixed in place, less the retained percentage, at the time the certificate should issue, even though the Architect fails to issue it for any cause not the fault of the Subcontractor.

I. To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the Subcontract.

J. That no claim for services rendered or Materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten days of the calendar month following that in which the claim originated.

K. To give the Subcontractor an opportunity to be present and to submit evidence in any progress conference or dispute involving the Subcontractor's Work.

L. To pay the Subcontractor a just share of any fire insurance money received by the Contractor, under Article 27 of the General Conditions.

M. If Performance Bonds and Payment Bonds were required of File Bidders by the Instructions to Bidders, then the Contractor will provide proof of receipt of said bonds to the University prior to the submission of the first Requisition for Payment.

N. To pay the Subcontractor or Material Supplier all monies requisitioned from the Owner as a result of invoices or billings from the Subcontractor or material supplier within seven (7) days of receipt of payment from the Owner.

Article 36 Architect's Status

The Architect shall be the Owner's representative during the construction period and the Architect shall observe the work in process on behalf of the Owner. The Architect shall have authority to act on behalf of the Owner only to the extent expressly provided in the Contract Documents or otherwise in writing, which shall be shown to the Contractor. The Architect shall have authority to stop the work whenever such stoppage may be necessary in the Architect's reasonable opinion to insure the proper execution of the contract.

The Architect shall be, in the first instance, the interpreter of the conditions of the Contract and the judge of its performance. The Architect shall side neither with the Owner nor with the Contractor, but shall use the Architect 's powers under the Contract to enforce its faithful performance by both.

In case of the termination of the employment of the Architect, the Owner shall appoint a capable and reputable Architect against whom the Contractor makes no reasonable objection, whose status under the contract shall be that of the former Architect.

Article 37 Cash Allowances

The Contractor shall include in the Contract sum all Allowances named in the Contract Documents and shall cause the Work so covered to be done by such Contractors and for such sums as the Architect may direct, the Contract Amount being adjusted in conformity therewith. The Contractor declares that the Contract Amount includes such sums for expenses and profit on account of cash allowances as deemed proper. No demand for expenses or profit other than those included in the Contract Amount shall be allowed. The Contractor shall not be required to employ for any such Work persons against whom the Contractor has a reasonable objection.

Article 38 Uses of Premises

The Contractor shall confine the Contractor's apparatus, the storage of mate rials and the operations of the Contractor's workmen to limits indicated on the plans or by law, ordinances, permits or directions of the Architect and shall not unreasonably encumber the premises with the Contractor's materials.

The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety. The Contractor shall enforce the Architect's instructions regarding signs, advertisements, fires and smoking.

If any part of the project is completed and ready for use, the Owner may, by written and mutual consent, without prejudice to any of the Owner's rights or the rights of the Contractor, enter in and make use of such completed parts of the project. Such use or occupancy shall in no case be construed as an acceptance of any work or materials.

The University of Maine System must comply with the "Workplace Smoking Act of 1985". In compliance with this law, the University of Maine System has prohibited smoking in all University System buildings except in designated smoking areas. This rule must also apply to all contractors and workers in existing University System buildings. The Contractor shall be responsible for the implementation and enforcement of this requirement within existing University System buildings.

Article 39 Cutting, Patching and Digging

The Contractor shall do all cutting, fitting or patching of the Contractor's work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon, or reasonably implied by, the Drawings and Specifications for the completed structure, and the Contractor shall make good after them as the Architect may direct.

Any cost caused by defective or ill-timed Work shall be borne by the party responsible therefor. The Contractor shall not endanger any Work by cutting, excavating or otherwise, and shall not cut or alter the Work of any other Contractor save the consent of the Architect. Cutting, drilling, or patching Work of Contractors other than the General Contractor shall be done only with the permission and instruction of the General Contractor and Architect. Cutting of structural members must be approved by the Architect. All cutting, patching, and digging of other Contractors in or about the Building shall be done under the supervision of the General Contractor who shall be responsible to see that the Work is neatly done, and in a manner that will not endanger the structure or harm the component parts, and that patching and back-filling shall be done to restore the structure and surfaces to its original condition.

Article 40 Layout of Work

The Contractor shall be responsible for the correct staking out of the new work on the site, and shall employ a competent engineer therefor. The Contractor's engineer shall run the axis lines locating the work, establish correct datum points, and check each line and point on the site to insure their correctness. All such lines and points shall be carefully preserved throughout construction.

The Contractor shall lay out all work from dimensions given on plans. The Contractor shall take measurements and verify dimensions of existing or old work, if any, that affect the Contractor's work or to which the Contractor's work is to be fitted. The Contractor alone shall be responsible for the correctness of all measurements, and shall verify all grades, lines, levels, elevations and dimensions shown on the drawings. Report any errors or inconsistencies to the Architect prior to commencing work.

Article 41 Workmanship

All Workmanship, Materials or Equipment, either at the Site or intended for it shall conform in all respects with the requirements of all the Contract Documents, and shall be a strictly first class, workmanlike installation and the best obtainable from the crafts and trades. Incomplete or careless workmanship will not be allowed. In all cases, the materials, equipment and workmanship shall be equal to or better than the grade specified, and the best of their kind that is obtainable for the purpose for which they are intended. The Architect's decision on the quality of work shall be final.

All Labor shall be performed by mechanics skilled in their respective trades. Prior to submitting a bid, the Contractor shall become familiar with the local labor conditions, skilled and unskilled.

If, in the opinion of the Contractor, any work is indicated on the drawings or specified in such a manner as would make it impossible to produce work of the highest quality, or should discrepancies appear between drawings, or drawings and specifications, the Contractor shall refer the same in writing to the Architect for interpretation before proceeding with the work.

If the Contractor fails to make such a reference, no excuse will be entertained thereafter for failure to carry out the work in a satisfactory manner.

The Contractor shall guarantee the Contractor's work against any defects in workmanship and materials for a period of one year from the date of the written acceptance of the project.

Article 42 Asbestos Removal

The Owner shall be responsible for the removal of all asbestos containing material (ACM). The Contractor shall notify the Owner immediately if suspect ACM is inadvertently disturbed during the course of the work or if suspect ACM must be identified and removed in order to complete the contract.

Article 43 Cleaning Up

The Contractor shall at all times keep the premises free from accumulation of waste materials or rubbish caused by the Contractor's employees or work, and at the completion of the work the Contractor shall remove all the Contractor's rubbish from and about the project and all tools, scaffolding and surplus materials and shall leave the work "Broom clean" or its equivalent, unless more exactly specified. In case of dispute, the Owner may remove the rubbish and charge the cost to the several contractors as the Architect shall determine to be just.

Article 44 Contract Disputes

If, in the construction of any public work, including buildings, highways, bridges, dams and drainage structures, which the University of Maine System does by contract, there arises a dispute between the University of Maine System and the Contractor which cannot be settled, then this dispute shall be submitted to arbitration, and both the University of Maine System and the Contractor shall be bound by the decision of the arbitrator.

The membership of the American Arbitration Association shall be used as arbitrators, and the procedures used for arbitration shall be in conformity with the Construction Industry Arbitration Rules, as administered by the American Arbitration Association.

Article 45 Job Site Safety

The Contractor shall adhere to the Occupational Safety and Health Administration's (OSHA's) most recently published Safety and Health Regulations for Construction (29 CFR 1926) and general Occupational Safety and Health Standards (29 CFR 1910) for the duration of this Contract. The Contractor shall, before the first application for payment, submit to the Architect two copies (one for forwarding to the University of Maine System) of the Contractor's written Hazard Communication Program. Additionally, if the contractor will be using electrical circuits that are not part of a building or structure and not equipped with ground fault interrupt systems, two copies of the Contractor's written Assured Equipment Grounding Conductor Program shall also be submitted to the Architect before the first application for payment.

Prior to the commencement of any phase of work under this Contract, the Contractor will submit the name(s) of the person(s) who is(are) designated as being responsible for job site safety under this contract and is(are) familiar with the above referenced OSHA regulations.

Where any of the Contractor's operations occur in, on, or within 50 feet of any door, window, air intake in a building occupied by University employees or students, the Contractor shall, not less than 14 days prior to the start of any operation, provide directly to the Owner's representative (with copies to the Architect) Material Safety Data Sheets (not previously submitted with Hazard Communication Program, required in paragraph 1 of this article) on all materials to be used in the operation that may be classified as hazardous under the Maine Chemical Substance Identification Law (26 MRSA §1709 through §1712).

SECTION 00800

SUPPLEMENTARY CONDITIONS

1. STANDARDS USED FOR THIS PROJECT

   a. Where possible, products or processes mentioned in these specifications shall be related to the appropriate standard specifications of recognized organizations.

   b. Codes, standards and publications of private and public bodies mentioned in these specifications, and other such standards and specifications, refer to the latest additions thereof at the time of taking bids.

2. DEFINITIONS - The following definitions shall apply when used in these contract documents:

   a. Furnish shall mean supply and deliver to project site.

   b. Provide shall mean furnish and install, complete and ready for intended use.

   c. Install shall mean to place in position for service or use.

3. FIRE PROTECTION

   a. The Contractor shall take all necessary precautions to insure against fire during construction. The Contractor shall be responsible that the area within contract limits is kept orderly and clean, that the combustible rubbish is promptly removed from the site. No rubbish will be burned at the site. The Contractor shall provide and keep in working order, an adequate number of fire extinguishers, conveniently located and designed for the hazard at hand.

   b. Combustible materials shall be transported and stored on the site in conformance with state and local codes. No accumulation of inflammable rubbish shall remain in any building overnight.

4. COOPERATION

   a. It is the responsibility of the Contractor to work in cooperation with sub-contractors and the Owner's crews at the site.

   b. At no time shall pedestrian access or egress to buildings be cut off by equipment, stockpiled material or barricades.

5. EMERGENCIES

   The Contractor shall furnish to the Architect, in writing, the names, addresses and telephone numbers of the members of the Contractor's organization to be contacted in the event of an out-of-hours emergency at the construction site.

6. TEMPORARY WEATHER PROTECTION

   a. The Contractor shall provide all temporary closures, coverings, weather protection, etc.,

required for the protection of structures built and work done under this Contract during the period of the Contractor's operations. At the end of each day's work all new and existing work likely to be damaged shall be covered.

b. Materials for making instant weather protection shall be kept on hand at all times. Materials used for temporary protection shall be subject to the approval of the Owner's Representative. Tarpaulins must be flameproof type.

c. Any damage to existing buildings, and/or their contents caused by insufficient or inadequate weather protection or maintenance of such protection, shall be made good by the Contractor to the Owner's satisfaction.

7. TEMPORARY PROTECTION

a. The Contractor shall protect all streets, curbs, lawns, shrubs, and sidewalks and, if damaged, shall make all necessary repairs at the Contractor's own expense.

b. The Contractor shall provide and maintain barricades or roped off areas when working above or where danger may result from falling material or debris.

c. The Contractor shall provide and maintain guard lights at all nighttime barricades, railings, obstructions in the streets, roads or sidewalks.

d. Snow & Ice: The Contractor shall remove all snow and ice as may be required for the proper protection and/or execution of the work.

8. TEMPORARY DUSTPROOF PROTECTION

a. Prior to performing any demolition or removal work on a building, the Contractor shall provide temporary dustproof protection around the area of work as required to prevent dust or flying particles from entering occupied areas of building.

b. Where the possibility of damage to areas adjacent to work exists, the Contractor shall avoid any damage by covering surfaces with plywood and tarpaulins. Upon completion, remove all protection, debris of any kind, and make such surface repairs as required by the Owner.

9. USE OF EQUIPMENT

If the University permits the Contractor to use any of the University's equipment, tools, or facilities, such use will be gratuitous, and the Contractor shall release the University from any responsibility arising from claims for personal injuries, including death, arising out of the use of such equipment, tools, or facilities, irrespective of the condition thereof or any negligence on the part of the University in permitting their use.

10. REPAIR OF DAMAGED AREAS

Repair all streets, drives, curbs, sidewalks, fences, poles, and lawns where disturbed by construction operations, and leave them in as good condition after completion of the work as before operations started.

11. NON-DISCRIMINATION IN EMPLOYMENT

In the execution of the Contract, the contractor, all sub-contractors and suppliers agree to take affirmative action to be sure that persons are employed on the basis of occupational qualifications without regard to race, color, creed, national origin, ancestry or sex. The provisions of the nondiscrimination clause contained in Section 202, Executive Order 11246, as amended by Executive Order 11375, related to Equal Employment Opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the Secretary of Labor, are incorporated herein. The University of Maine System has an affirmative action program. Further, there shall be no discrimination in employment of qualified individuals because of handicap.

12. CONFLICTS - PLANS AND SPECS

a. In the event of conflict or discrepancies in the Contract Documents, then the following shall govern in the order stated:

1. Figured dimensions on the plan shall govern over all scale drawings, except those designated as full size drawings.

2. Large scale details shall govern over small scale drawings.

3. Figured dimensions in specifications shall govern over scale drawings without figured dimensions.

4. Specifications shall govern over plans and general notes insofar as quality of material, quality of workmanship and composition of materials are concerned.

b. The hierarchy of precedence above does not authorize the Contractor to decide which of the conflicting versions to follow for construction. The Architect/Engineer is the sole party authorized to resolve conflicts in the documents.

13. WORK SCHEDULES

a. The work shall be performed with a minimum of inconvenience to the Owner. The Contractors shall work closely with the Owner's Representative and schedule work accordingly.

b. When it becomes necessary to shut down any facilities in the building or any portion of the building, the Owner's Representative shall be contacted and such arrangements made with a minimum of 24-hours notice to the Owner's Representative.

14. SALVAGE

All materials removed from the building as part of this work shall become property of the contractor unless specific specification section states otherwise.

15. VERIFYING MEASUREMENTS

General Contractor and all Subcontractors shall verify measurements given with existing work and conditions found at the building and accommodate work thereto.

16. LIQUIDATING DAMAGES

a. The Date of Completion is stated in the Proposal Form Section and in the Contract Form Section. If the Contractor finds it impossible to complete the work on or before the said Date of Completion, the Contractor may make a written request to the Architect for an extension of time setting forth therein the reasons for the request. If the Architect finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, the Architect may extend the Date of Completion in such amount as, in the Architect's judgment, the conditions warrant. The said new Date of Completion shall then be in full force and effect the same as though it were the original Date of Completion.

b. Time is an essential element of the Contract and it is important the work be pressed vigorously to completion. The cost to the Owner of administration Contract, inspection and supervision will be increased as the time occupied in the work is lengthened.

c. For each calendar day that any work shall remain uncompleted after the Date of Completion specified in the Contract, the amount per day, listed below in the Schedule of Liquidated Damages, shall be deducted from any money due the Contractor, not as a penalty, but as liquidated damages; provided, however, that due account shall be taken of any adjustment of the Date of Completion granted by Contract Change Order.

SCHEDULE OF LIQUIDATED DAMAGES

Original Contract Amount	Amount of Liquidated Damages Per Day
More than $ 10,000 and less than $ 50,000	100.00
More than 50,000 and less than 100,000	150.00
More than 100,000 and less than 250,000	200.00
More than 250,000 and less than 500,000	250.00
More than 500,000 and less than 1,000,000	375.00
More than 1,000,000	500.00

GENERAL DECISION **ME020001** 03/07/2003 ME1

Date: March 7, 2003
General Decision Number **ME020001**

Superseded General Decision No. ME010001

State: Maine

Construction Type:
BUILDING

County(ies):
ANDROSCOGGIN CUMBERLAND PENOBSCOT

Building Construction Projects (does not include single family homes and apartments up to and including 4 stories).

Modification Number	Publication Date
0	03/01/2002
1	04/05/2002
2	06/07/2002
3	07/05/2002
4	01/17/2003
5	03/07/2003

COUNTY(ies):
ANDROSCOGGIN CUMBERLAND PENOBSCOT

BOIL0029D 10/01/2001

	Rates	Fringes
BOILERMAKERS	24.17	11.02

CARP1996A 10/01/2001

	Rates	Fringes
CARPENTERS		
(Including acoustical ceiling installation, drywall hanging and batt insulation installation)		
Carpenters	14.75	6.95
Millwrights	19.25	6.20

ELEC0567D 12/01/2002

	Rates	Fringes
ANDROSCOGGIN COUNTY: Townships of Auburn, Durham, Lewiston, Lisbon, Mechanic Falls, Minot, Poland		
CUMBERLAND COUNTY: Entire County (All Townships)		
PENOBSCOT COUNTY: Entire County excluding 2R.8, Chester, Prentis, Seboeis, Webster, and Winn Townshps and area south thereof.		
ELECTRICIANS	23.28	10.25
Teledata Technicians	19.00	8.73

ELEC1253E 12/01/2001

	Rates	Fringes
ANDROSCOGGIN COUNTY (Townships of Greene, Leeds, Livermore, Livermore Falls, Turner, Wales, Webster)		
PENOBSCOT COUNTY (Townships of Alton, Argyle, Bangor, Bradford, Bradley, Brewer, Burlington, Carmel, Carroll, Charleston, Chester, Clifton, Corinna, Corinth, Dixmont, Eddington, Edinburg, Enfield, Etna, Exeter, Garland, Glenburn, Grand Falls, Greenbush, Greenfield, Hampden, Hermon, Holden, Howland, Hudson, Kenduskeag, LeGrange, Lakeville, Lee, Levant, Lincoln, Lowell, Mattamiscontis, Maxfield, Milford, Newburg, Newport, Old Town, Orono, Orrington, Passadumkeag, Plymouth, Prentiss, Seboeis, Springfield,Stetson, Summit, Veazie, Webster, Winn, 2R.8, 3R.1, 5R		
ELECTRICIANS	22.00	10.02
Teldata Technicians	18.00	7.90

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* IRON0496B 03/16/2002

	Rates	Fringes
IRONWORKERS		
Structural and Reinforcing	19.90	13.24

SUME4017A 10/24/2000

	Rates	Fringes
BRICKLAYERS	15.12	2.66
CAULKER/WATERPROFFERS	13.49	3.40
CEMENT MASONS/FINISHERS	11.71	1.26
DRYWALL FINISHERS	13.09	
ELEVATOR CONSTRUCTORS	20.07	6.26
LABORERS (Including General Laborers and Brick Mason Tenders	10.55	4.40
PIPEFITTERS	17.89	7.40
PLUMBERS	13.92	1.19
POWER EQUIPMENT OPERATORS:		
Backhoes	14.22	5.39
Cranes	14.78	4.47
Excavators	14.53	2.45
Loaders	13.95	2.71
Rollers	13.50	4.31
ROOFERS	11.47	1.91
SHEETMETAL WORKERS	12.47	3.61
SPRINKLER FITTERS	10.53	1.27

TRUCK DRIVERS		
Dump	10.33	1.27
Tri Axle	10.11	2.02

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

==========

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

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations

indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

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

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

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

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

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

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

END OF GENERAL DECISION

SECTION 00840

CONTRACTOR'S EXEMPT PURCHASE CERTIFICATE

Date:_____

TO:

vendor name

_____
vendor address

_____
vendor address

I hereby certify under penalties of perjury, that:

I am engaged in the performance of a construction contract on a project for the University of Maine System which is a Sales Tax exempt organization under the Maine Sales and Use Tax Law, Section 1760, subsection 2 and 16;

This project is titled _____ ;
Project Title

The project is located at _____ ;
Campus name or town

This certificate is issued to cover purchases of materials and supplies designated by me, for use on the above identified project.

Signed: _____
Authorized signature

FIRM: _____

SECTION 00850
UNIVERSITY OF MAINE SYSTEM

Req No. _____

CONTRACTOR'S PAYMENT REQUISITION
and
CERTIFICATION

Contractor's Name _____ Date

Address

Vendor No. _____ Account No.

Project Name

Payment Period from _____ to

REQUISITION SUMMARY

	Contract	Previous Payments	Current Request	Balance	% Comp
Totals					
5% Retained					
Total Paid					
Payment Due					

_____ PAY

Contractor's Certification

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Payment Requisition has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Payment Requisitions were issued and payments received from the University of Maine System, and that current payment shown herein is now due.

Contractor's Signature _____ Date: _____

Payment of the above amount is recommended:

Designer's Signature _____ Date: _____

Payment approved for University of Maine System

Authorized Signature _____ Date: _____

UNIVERSITY OF MAINE SYSTEM

Req No. _____

CONTRACTOR'S PAYMENT REQUISITION
And
CERTIFICATION Continuation Sheet

Contractor's Name _____ Date _____ Page ___ of ___

Project Name _____

Items	Contract	Previous Payments	Current Estimate	Balance	% Comp
Page Total					

SECTION 00860
CONTRACT CHANGE ORDER FORM

____
Designer

____
Address

____

CONTRACT CHANGE ORDER NO. ________________________ DATE __________________

TO ____
Name of Contractor

____ AMOUNT ______________
Address

CONTRACT FOR

____
Project Location

~~~~~~
~~~~

Consider this Authority to perform the following:

Requested by: __________________________
State reason or necessity:

	Add.	Deduct	Amount
Amt. this Chg. Order			
Amt. prev. Chg. Order			
Net Chg. Orders to date			
Original Contract			
Total to Date			

Approved by:
Designer

Signed by:
Contractor

Signed by:
University of Maine System

Change will delay completion ____________ days

New Completion Date ____________

NOTE: NECESSARY SKETCHES AND BACK-UP TO BE ATTACHED TO EACH COPY

SECTION 00870

Corporate or Business Letterhead

WAIVER OF LIEN

STATE OF MAINE
COUNTY OF _____

Date: _____

TO: **c/o Mr. Dana A. Gray,**
Project Engineer, University of Southern Maine
Facilities Management
PO Box 9300
96 Falmouth Street
Portland, ME 04104-9300

SUBJECT: _____
Project Name

_____
Project Location

Upon receipt of the sum of _____ (being the balance due us under the existing contract or subcontract agreement for work on the Subject Project) the undersigned agrees that it will waive and release the University of Maine System from any and all lien or claim or right to lien on the Subject Project under the Statutes of the State of Maine relating to liens for labor, materials and/or subcontracts furnished for the Subject Project on premises belonging to the University of Maine System.

Signed: _____
Authorized signature

Title: _____

Firm Name: _____

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20 _____.

_____
Notary Public

SECTION 00890

LIST OF DRAWINGS

GENERAL DRAWINGS

GI001	COVER SHEET
GI002	GENERAL INFORMATION

ARCHITECTURAL DRAWINGS

AD100	BASEMENT DEMOLITION FLOOR PLAN
AD101	FIRST FLOOR DEMOLITION PLAN
AD102	SECOND FLOOR DEMOLITION PLAN
AD103	THIRD FLOOR DEMOLITION PLAN
AD104	FOURTH FLOOR DEMOLITION PLAN
AD105	FIFTH FLOOR DEMOLITION PLAN
AD106	SIXTH FLOOR DEMOLITION PLAN
AD107	SEVENTH FLOOR DEMOLITION PLAN
AD108	ROOF DEMOLITION PLAN
AE100	BASEMENT FLOOR PLAN
AE101	FIRST FLOOR PLAN
AE102	SECOND FLOOR PLAN
AE103	THIRD FLOOR PLAN
AE104	FOURTH FLOOR PLAN
AE105	FIFTH FLOOR PLAN
AE106	SIXTH FLOOR PLAN
AE107	SEVENTH FLOOR PLAN
AE108	FIRST FLOOR REFLECTED CEILING PLAN
AE109	SECOND FLOOR REFLECTED CEILING PLAN
AE110	THIRD FLOOR REFLECTED CEILING PLAN
AE111	FOURTH FLOOR REFLECTED CEILING PLAN
AE112	FIFTH FLOOR REFLECTED CEILING PLAN
AE113	SIXTH FLOOR REFLECTED CEILING PLAN
AE114	SEVENTH FLOOR REFLECTED CEILING PLAN/BASE BID & ALT. #5
AE115	ROOF PLAN
AE120	ALTERNATE #1 AND #5 FLOOR PLANS
AE201	INTERIOR ELEVATIONS
AE210	INTERIOR ELEVATIONS – ALTERNATES #1 & #5
AE401	ENLARGED PLANS
AE402	ENLARGED PLANS
AE403	ENLARGED ELEVATOR PLAN, SECTION & DETAILS
AE501	INTERIOR SECTIONS & DETAILS
AE502	INTERIOR SECTIONS & DETAILS

AE503	PLAN DETAILS & SECTIONS
AE504	PLAN DETAILS & SECTIONS
AE505	PLAN DETAILS
AE510	ALTERNATE MILLWORK & CASEWORK DETAILS
AE511	ALTERNATE MILLWORK & CASEWORK DETAILS
AE512	ALTERNTE MILLWORK & CASEWORK DETAILS
AE513	ALTERNATE MILLWORK ELEVATIONS & DETAILS
AE514	ALTERNATE MILLWORK & CASEWORK DETAILS
AE601	ROOM FINISH SCHEDULE
AE602	ROOM FINISH SCHEDULE
AE603	DOOR & WINDOW SCHEDULE
AE605	DOOR/WINDOW DETAILS & SECTIONS
AF107	SEVENTH FLOOR FINISH PLAN

STRUCTURAL DRAWINGS

SB101	FOUNDATION PLAN & SECTIONS
SF101	SEVENTH FLOOR FRAMING PLAN & NOTES
SF501	FRAMING SECTIONS & DETAILS

FIRE PROTECTION DRAWINGS

FP100	BASEMENT SPRINKLER PLAN
FP101	FIRST FLOOR SPRINKLER PLAN
FP102	SECOND FLOOR SPRINKLER PLAN
FP103	THIRD FLOOR SPRINKLER PLAN
FP104	FOURTH FLOOR SPRINKLER PLAN
FP106	SIXTH FLOOR SPRINKLER PLAN

MECHANICAL DRAWINGS

M-001	LEGEND AND ABBREVIATIONS
MD101	FIRST FLOOR DEMOLITION PLAN
MD102	SECOND FLOOR DEMOLITION PLAN
MD105	FIFTH FLOOR DEMOLITION PLAN
MD106	SIXTH FLOOR DEMOLITION PLAN
MD107	SEVENTH FLOOR DEMOLITION PLAN
MH101	FIRST FLOOR DUCTWORK PLAN
MH102	SECOND FLOOR DUCTWORK PLAN
MH105	FIFTH FLOOR DUCTWORK PLAN
MH106	SIXTH FLOOR DUCTWORK PLAN
MH107	SEVENTH FLOOR DUCTWORK PLAN
MH108	MECHANICAL ROOF PLAN
MH126	SIXTH FLOOR DUCTWORK PLAN ALTERNATE #4

MP105	FIFTH FLOOR PIPING PLAN
MP106	SIXTH FLOOR PIPING PLAN
MP107	SEVENTH FLOOR PIPING PLAN
MP126	SIXTH FLOOR PIPING PLAN ALTERNATE #4
MH301	SECTIONS
MP401	PIPING PART PLANS
M-501	DETAILS
M-601	SCHEDULES
M-602	SCHEDULES
MP651	MECHANICAL PIPING SCHEMATICS

PLUMBING DRAWINGS

PL100	BASEMENT PLUMBING PLAN
PL105	FIFTH FLOOR PLUMBING PLAN
PL106	SIXTH FLOOR PLUMBING PLAN
PL107	SEVENTH FLOOR PLUMBING PLAN
PL401	DOMESTIC WATER & SANITARY/VENT PART PLANS
PL601	SCHEDULES & DETAILS

ELECTRICAL DRAWINGS

E-001	LEGEND & GENERAL NOTES
ED101	FIRST FLOOR LIGHTING DEMOLITION PLAN
ED103	THIRD FLOOR LIGHTING DEMOLITION PLAN
ED105	FIFTH FLOOR LIGHTING DEMOLITION PLAN
ED106	SIXTH FLOOR LIGHTING DEMOLITION PLAN
ED107	SEVENTH FLOOR LIGHTING DEMOLITION PLAN
ED111	FIRST FLOOR POWER DEMOLITION PLAN
ED115	FIFTH FLOOR POWER DEMOLITION PLAN
ED116	SIXTH FLOOR POWER DEMOLITION PLAN
ED117	SEVENTH FLOOR POWER DEMOLITION PLAN
ED121	FIRST FLOOR SYSTEMS DEMOLITION PLAN
ED126	SIXTH FLOOR SYSTEMS DEMOLITION PLAN
ED127	SEVENTH FLOOR SYSTEMS DEMOLITION PLAN
EL101	BASEMENT & FIRST FLOOR LIGHTING PLAN
EL102	SECOND FLOOR LIGHTING PLAN
EL103	THIRD FLOOR LIGHTING PLAN
EL104	FOURTH FLOOR LIGHTING PLAN
EL105	FIFTH FLOOR LIGHTING PLAN
EL106	SIXTH FLOOR LIGHTING PLAN
EL107	SEVENTH FLOOR LIGHTING PLAN
EL601	LIGHTING SCHEDULE

EP100	BASEMENT POWER PLAN
EP101	FIRST FLOOR POWER PLAN
EP102	SECOND FLOOR POWER PLAN
EP103	THIRD FLOOR POWER PLAN
EP104	FOURTH FLOOR POWER PLAN
EP105	FIFTH FLOOR POWER PLAN
EP106	SIXTH FLOOR POWER PLAN
EP107	SEVENTH FLOOR POWER PLAN
EP108	ROOF POWER PLAN
EP601	POWER PANEL SCHEDULES
EP602	POWER PANEL SCHEDULES
EP651	ONE-LINE DIAGRAMS
EY101	FIRST FLOOR SYSTEMS PLAN
EY102	SECOND FLOOR SYSTEMS PLAN
EY103	THIRD FLOOR SYSTEMS PLAN
EY104	FOURTH FLOOR SYSTEMS PLAN
EY105	FIFTH FLOOR SYSTEMS PLAN
EY106	SIXTH FLOOR SYSTEMS PLAN
EY107	SEVENTH FLOOR SYSTEMS PLAN

END OF DRAWING LIST

SECTION 01100

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of interior renovations to Glickman Library, University of Southern Maine.
   1. Project Location: Portland, Maine
   2. Owner: University of Southern Maine

B. Architect Identification: The Contract Documents, dated March 17, 2003, were prepared for Project by SMRT, Inc., 144 Fore Street, Portland, Maine, 04104.

C. Work includes but is not limited to, selective demolition, concrete topping slabs, steel structure and decking, repairs to existing roof membrane, metal stud partitions, insulation, gypsum board walls and ceilings, ceramic tile, acoustical ceilings, resilient flooring, carpeting, custom cabinets and fixtures, carpentry, interior aluminum storefront system, painting, metal doors, wood doors, metal frames, door hardware, toilet partitions and accessories, signage, new passenger elevators, renovations to existing fire protection and detection systems, electrical, and heating, ventilating, and air conditioning complete and ready for use.

1.3 CONTRACT

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

B. Contract Type: UMS Contract - Section 00500 Contract Agreement (Long Form).

1.4 WORK SEQUENCE

A. The Owner's anticipated construction schedule as stated in the Proposal Form (Section 00300) is fixed. There is no advantage to the Owner of an early finish and there will be no rewards for an early finish or delay claims awarded for delays based on Contractor established early completion dates.

B. The Contract Documents shall not be considered to be without error, inconsistency or omission. Include a reasonable time contingency in the planning of the project to allow for the clarification and instructions that arise out of the limitations of the contract documents.

1.5 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations, during construction period.

B. General: Limit use of site and premises to allow:
1. Owner occupancy.
2. Work by Others and Work by Owner.
3. Use of site and premises by public.

C. Use of Existing Building: Maintain the existing building in a weather tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

D. Emergency Building Exits During Construction: Maintain all existing exits and egress areas.

E. Construction Operations: Confine operations to areas within Contract limits indicated. Portions of the building beyond areas in which construction operations are indicated are not to be disturbed.

F. Time Restrictions for Performing Interior Work: Monday through Friday; 7 am to 5 p.m., unless arrangements are made with the Owner prior to the start of work.

G. **No construction work may be performed during the dates of June 16 – 20, 2003.**

1.6 OWNER OCCUPANCY

A. The Owner will occupy the site and premises during the entire period of construction.
1. Owner currently occupies the basement through the fourth floors.

B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.7 WORK UNDER OTHER CONTRACTS

A. Separate Contract: Owner will award a separate contract for performance of certain construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract. This contract will include the following:
1. Access Controls: A separate contract will be awarded for the furnishing and providing of magnetic locks and card readers. Conduit and wiring for these items will be provided by the Contractor.
2. Data Cabling: A separate contract will be awarded for the installation of data cabling. Installation of conduit for this item will be provided by the Contractor.

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

C. Items noted NIC (Not in Contract), movable cabinets, furnishings, minor equipment, and other items as noted will be supplied and installed by Owner after Substantial Completion.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
   1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.9 MISCELLANEOUS PROVISIONS

A. Contract Documents: These documents, including the Contract, General Conditions, Supplementary Conditions, Specification sections, Drawings, Addenda and Modifications, indicate the work of the Contract and related requirements and conditions that have an impact on the project. It is recognized that work of the contract is also unavoidably affected or influenced by governing regulations, natural phenomenon including weather conditions and other forces outside the contract documents.

B. Hazardous Materials other than Asbestos: Included in the work may be the removal and/or covering over of hazardous materials. It is the responsibility of the contractor to follow applicable Federal, State and Local guidelines to insure safe and proper handling of these materials.

PART 2 - PRODUCTS (Not Used)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Additional Doors at Special Events. Reference Detail A1/AE120, and details referenced on other drawings.

B. Alternate No. 2: Replace existing on/off sprinkler heads on Floors Basement through 4th with standard sprinkler heads.

C. Alternate No. 3: Retrofit existing lighting on Floors 1 through 4 as depicted on Drawings EL101 – EL104.

D. Alternate No. 4: Mechanical Boiler. Provide additional boiler (B-4) as indicated in the Specification Section 15514 – Finned Water-Tube Boilers and on the drawings. This alternate includes the boiler, appurtenances, sealed direct-vent chimney, injection circulator and gas-piping, electric power and controls. Provide additional air handler unit to serve special collections area on 6th Floor and associated dedicated chiller.

E. Alternate No. 5: Millwork as depicted on Drawing AE120, Details F1, A8 and A12 and referenced details on other drawings, including EL106, EP106 and EP107.

F. Alternate No. 6: Installation of third passenger elevator and all associated work.

G. Alternate No. 7: Temperature Controls. The existing Air Handling Units (AHU-1B, 2, 3 and 4) are presently controlled by a Honeywell pneumatic DDC system. This alternate will remove those controls and install controls per the Specifications Section 15926 – Energy Management and Control System and Section 15940 – HVAC Sequence of Operation.

H. Alternate No. 8: Gas Booster. Install a second natural gas booster identical to the existing in parallel with the existing including a bypass with isolation valves. See the detail on drawing PL601 and the specification in Section 15146 – Plumbing Specialties.

I. Alternate No. 9: 2nd Floor HVAC.

END OF SECTION 01230

SECTION 01250

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
   1. Multiple Prime Contracts: Provisions of this Section apply to the work of each prime contractor.

B. Related Sections include the following:
   1. Division 1 Section "Unit Prices" for administrative requirements for using unit prices.
   2. Division 1 Section "Submittal Procedures" for requirements for the Contractor's Construction Schedule.
   3. Division 1 Section "Payment Procedures" for administrative procedures governing Applications for Payment.
   4. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 14 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
   5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Architect will issue a Change Order for signatures of Owner and Contractor on form 00860 - Contract Change Order Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250

SECTION 01270

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Division 1 Section "Quality Requirements" for general inspection requirements.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, and applicable taxes.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 – Electrical Duplex Outlet Box with Conduit:
   1. Description: Furnish and install one duplex type outlet box with 1/2 inch conduit to above finished ceiling or to underside of the concrete floor slab with pull string in conduit.
   2. Unit of Measurement: Each outlet box.

B. Unit Price No. 2 – Voice/Data Outlet Box:
   1. Description: Furnish and install Voice/Data outlet box with cover: Conduit from 18" aff. to above ceiling space or to underside of the concrete floor slab (no wire).
   2. Unit of Measurement: Each outlet box.

END OF SECTION 01270

SECTION 01290

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 1 Specification Sections, apply to this Section.

1.2 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.

1.3 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 1 Section "Allowances" for procedural requirements governing handling and processing of allowances.
   2. Division 1 Section "Unit Prices" for administrative requirements governing use of unit prices.
   3. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   4. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.4 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.

1.5 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.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of 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 submittal.
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 labor and materials where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed. Provide Labor and Materials breakdown for major portions of the Work such as sitework, masonry, structural steel, windows, doors and frames, hardware, fire protection, plumbing, heating and ventilating, electrical and other work as requested by the Architect.
   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
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. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. 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.

9. 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.

1.6 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 date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use Section 00850 - Contractor's Payment Requisition and Certification 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 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, before deduction for retainage, on each item.
   2. When an application shows completion of an item, submit final or full waivers.
   3. The list of subcontractors, principal suppliers and fabricators shall be used to designate which entities involved in the Work must submit waivers. The list shall be approved by the Owner.
   4. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   5. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
      a. Submit final Application for Payment with or preceded by final waivers from every entity on the list of subcontractors, principal suppliers and fabricators. Submit the list for Owner's approval.

6. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule (preliminary if not final).
5. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Certificates of insurance and insurance policies.
13. Performance and payment bonds.
14. Data needed to acquire Owner's insurance.
15. Initial settlement survey and damage report if required.

H. 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.

I. 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. Evidence that claims have been settled.
5. 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.
6. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General project coordination procedures.
   2. Conservation.
   3. Administrative and supervisory personnel.
   4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Construction Progress Documentation" for preparing and submitting the Contractor's Construction Schedule.
   2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

1.4 SUBMITTALS

A. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.

1.6 PROJECT MEETINGS

A. Preconstruction Conference: Architect will schedule a preconstruction conference before starting construction, at a time convenient to Owner and Contractor, but no later than 15 days

after execution of the Agreement. Conference will be held at Project site or another convenient location. Meeting will be conducted to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. First aid.
   p. Security.
   q. Progress cleaning.
   r. Working hours.
3. The Architect will record minutes and distribute copies after meeting to participants, with one copy to Owner, Contractor, participants, and those affected by decisions made.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related Change Orders.
   d. Purchases.
   e. Deliveries.
   f. Submittals.
   g. Review of mockups.
   h. Possible conflicts.
   i. Compatibility problems.
   j. Time schedules.
   k. Weather limitations.
   l. Manufacturer's written recommendations.
   m. Warranty requirements.

n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Required performance results.
u. Protection of construction and personnel.

3. The Architect will record minutes and distribute copies after meeting to participants, with one copy to Owner, Contractor, participants, and those affected by decisions made.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Progress Meetings: Architect will conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.
c. The Architect will record minutes and distribute copies after meeting to participants, with one copy to Owner, Contractor, participants, and those affected by decisions made.

d. 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.

D. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

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 the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Contractor's Construction Schedule.
   3. Submittals Schedule.
   4. Field condition reports.
   5. Special reports.
   6. Construction photographs.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
   5. Division 1 Section "Closeout Procedures" for submitting photographic negatives as Project Record Documents at Project closeout.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article and in-house scheduling personnel to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified. Submit items within 30 days of Notice to Proceed.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit two printed copies; one a single sheet of reproducible media, and one a print.

D. Preliminary Network Diagram: Submit two printed copies; one a single sheet of reproducible media, and one a print; large enough to show entire network for entire construction period.

E. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

F. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

G. Construction Photographs: Submit two prints of each photographic view within seven days of taking photographs.
1. Format: 8-by-10-inch (203-by-254-mm) smooth-surface matte prints on single-weight commercial-grade stock, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
   a. Name of Project.
   b. Name and address of photographer.
   c. Name of Architect.
   d. Name of Contractor.
   e. Date photograph was taken.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
3. Negatives: Submit a complete set of photographic negatives in protective envelopes with each submittal of prints. Identify date photographs were taken.

H. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

I. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, area separations, and partial Owner occupancy.

4. Review time required for review of submittals and resubmittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for completion and startup procedures.
7. Review and finalize list of construction activities to be included in schedule.
8. Review submittal requirements and procedures.
9. Review procedures for updating schedule.

1.6 COORDINATION

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

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

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

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

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
   4. Startup and Testing Time: Include not less than 2 days for startup and testing for each floor.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Limitations of continued occupancies.
      c. Uninterruptible services.
      d. Partial occupancy before Substantial Completion.
      e. Use of premises restrictions.
      f. Provisions for future construction.
      g. Seasonal variations.
      h. Environmental control.
   3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
      a. Structural completion.
      b. Permanent space enclosure.
      c. Completion of mechanical installation.
      d. Completion of electrical installation.
      e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.

d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
   1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
   2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

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

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

3.2 CONSTRUCTION PHOTOGRAPHS

A. Photographic Film: Medium-format, 2-1/4 by 2-3/4 inches (60 by 70 mm).

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Photographs: Before starting construction, take four color photographs of each floor from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

D. Periodic Construction Photographs: Take four color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.
   1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

E. Final Completion Construction Photographs: Take eight color photographs after date of Substantial Completion for submission as Project Record Documents. Architect direct photographer for desired vantage points.

END OF SECTION 01320

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:
1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals and for erecting mockups.
5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.3 SUBMITTALS

A. Sample Submittal: Submit first project submittal within one week of Notice to Proceed. First project submittal shall be a sample of the Contractor's submittal review stamp incorporating the specified compliance statement. Submittal shall also demonstrate correct transmittal form, submittal format, numbering, etc. for project.

1.4 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action including product data submittals and shop drawings. Refer to Part 2.

B. Informational Submittals: Written information that does not require Architect's approval such as test reports, certifications, maintenance data, insurance certificates, etc. Refer to Part 2. Submittals may be rejected for not complying with requirements.

1.5 SUBMITTAL PROCEDURES

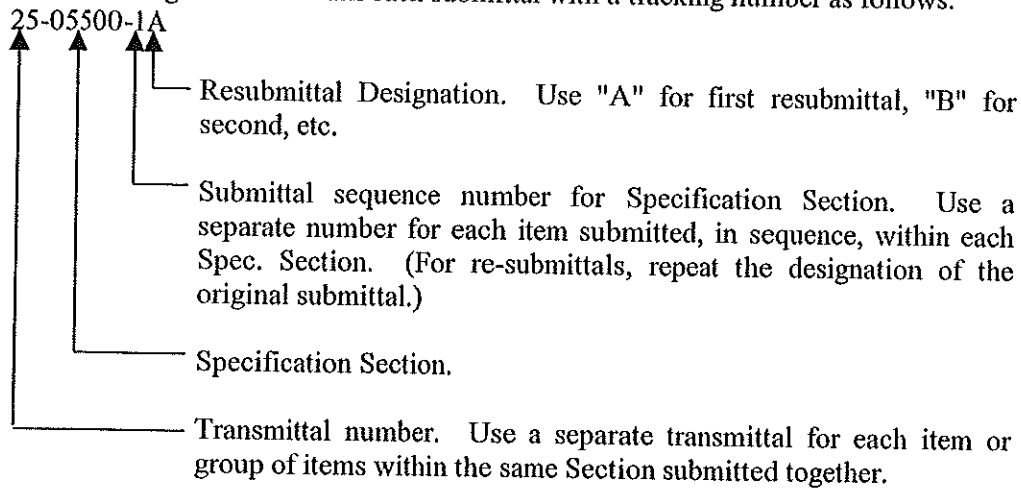
A. General: Copies of Architectural Floor Plan drawings in digital format will be provided for a fee by the architect to those requesting same in accordance with the "Authorization Statement for Electronic Transfer" form. (Example attached herein). Information provided in digital format is for the sole information and use of the authorizing entity. Further copying or transfer of this information is prohibited by copyright.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
   1. Initial Review: Allow 21 days for review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination. Submittal review periods will apply only with the submittal and approval of the submittal schedule.
   2. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

E. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 4 by 8 inches (100 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Submittal tracking number: Mark each submittal with a tracking number as follows:



4. 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 tracking number.
   i. Drawing number and detail references, as appropriate.
   j. Identification of submittal as an ACTION SUBMITTAL (requiring return) or INFORMATIONAL SUBMITTAL (requiring no return).
   k. Other necessary identification.

F. Deviations: Submit only specified products. Highlight, encircle, or otherwise identify minor deviations from the Contract Documents on submittals. Deviations not specifically approved and later found to be in conflict with Contract Documents may be rejected. Refer to Division 1 Section "Product Requirements" for substitution requirements.

G. Transmittal: Package each submittal individually and appropriately for review and handling. Submittals transmitted together will be reviewed and returned together. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
   1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
   2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
   3. Transmittal Form: Provide locations on form for the following information:
      a. Project name.
      b. Date.
      c. Destination (To:).
      d. Source (From:).
      e. Names of subcontractor, manufacturer, and supplier.
      f. Submittal tracking number.
      g. Submittal purpose and description.
      h. Submittal and transmittal distribution record.
      i. Remarks.
      j. Signature of transmitter.

H. Distribution: Furnish copies of approved submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Use only approved submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
   1. Number of Copies: Submit the number of copies of each submittal the Contractor requires plus those required for reviewers, unless otherwise indicated. Architect will retain two copies. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operating and maintenance manuals.
      k. Compliance with recognized trade association standards.
      l. Compliance with recognized testing agency standards.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Include the following information, as applicable:
      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. 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.
   2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
4. Number of Copies: Submit one reproducible print and two blue- or black-line prints. Architect will return the reproducible print. At the Contractor's option, a black line print may be submitted as the reproducible print.

D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."

E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
2. Samples for Selection:
   a. When indicated, submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   b. When indicated, submit full-size units or samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
3. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
   a. Generic description of Sample.
   b. Product name or name of manufacturer.
   c. Sample source.
4. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
   a. Size limitations.
   b. Compliance with recognized standards.
   c. Availability.
   d. Delivery time.
5. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
   a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three sets of paired units that show approximate limits of the variations.
   b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
6. Number of Samples for Selection: Submit three sets of Samples. Architect will retain one Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
   a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

7. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product.
   2. Number and name of room or space.
   3. Location within room or space.

G. Delegated-Design Submittal: Comply with requirements in Division 1 Section "Quality Requirements."

H. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Architect's action.

I. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

J. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."

K. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."

L. 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.

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 in Division 1 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

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. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

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.

J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.

K. 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.

L. 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.

M. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. 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.

N. 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.

O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."

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: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Stamp or statement shall include the following: "The Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of 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 respond to each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

- ☐ APPROVED
- ☐ PROVIDE AS NOTED
- ☐ REJECTED
- ☐ REVISE AND RESUBMIT
- ☐ RESUBMIT SPECIFIED ITEM
- ☐ INFORMATIONAL SUBMITTAL FOR RECORD ONLY
- ☐ NOT A REQUIRED SUBMITTAL - NOT REVIEWED

This review was performed for the limited purpose of determining general conformance with the design concept of the project and general compliance with the formation given in the Contract Documents. Modifications or comments made on the submittal during this review don not relieve the Contractor from compliance with the requirements of the drawings and specifications. Approval of a specific item does not include approval of the assembly of which the item is a component. The Contractor is

SMRT

ARCHITECTURE
ENGINEERING
PLANNING

AUTHORIZATION STATEMENT For ElectronicTransfer

Project No.: **Project Name:**

ORDERED BY: *(Type Company name, contact, and address)*

DESCRIPTION OF SERVICE: Providing electronic base drawing information.

FEE BASIS: ☐ $ (Minimum $250 per request) ☐ Fee Waived

TERMS AND CONDITIONS:

All documents and information prepared by SMRT, Inc. for this project, including information in electronic format, are instruments of our service, and are for use solely with respect to this project. SMRT, Inc. retains all common law, statutory and other reserved rights, including the copyright for these instruments of service.

Use of design information in electronic format from SMRT, Inc. does not represent review or approval of the user's work by the design professional. Making this information available in electronic format, in no way implies that the recipient is required by SMRT, Inc. to use it. Use of information supplied by SMRT, Inc. in electronic format is at the sole risk and liability of the user. The user agrees to waive any claim against SMRT, Inc. and our employees, and to defend, indemnify, and hold them harmless from any claim or liability that allegedly arises from the use of information furnished in electronic format.

The decision to use design information in electronic format obligates the user to verify the accuracy of the design against hardcopy representation of the design bearing the same issuance date. Information supplied in electronic format represents the most current status of the design at the date of the drawing's issuance. It is the user' s responsibility to verify that the electronic information in their possession stays current throughout the life of the project, and to update the information as required to maintain it current. The user is also responsible to compare design information received in electronic format with field measurements and conditions prior to their making use of the information.

Information provided in digital format is for the sole information and use of the authorizing entity. Further copying or transfer of this information is prohibited by copyright. Payment for information in electronic format is due in full prior to transmittal of the information.

AUTHORIZATION: I/We hereby grant permission or have obtained permission for SMRT, Inc. to perform the above services.

APPROVED/ACCEPTED BY: *(Type Company name)*

SIGN HERE: _____

Print or type signer's name here: _____

SMRT, INC.

_____
Project Manager

Date: _____

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PO Box 618
Portland, Maine 04104
☎ 207 772-3846
207 772-1070
www.smrtinc.com

SECTION 01400

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
   1. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 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.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

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

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.
   1. Contractor responsibilities include the following:
      a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by the Owner.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

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

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
2. Testing and balancing of the HVAC system will be the responsibility of the General Contractor. Reference Section 15950, "Testing, Adjusting & Balancing" for requirements.
3. Payment for these services will be made by the Contractor.
4. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
5. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
6. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

7. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
1. Testing agency will notify Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01420

REFERENCES

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 DEFINITIONS

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

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

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

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

F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

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

I. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.

J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
   1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

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

L. Substantial Completion: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. Minor corrections and repairs that can be performed while the Owner has occupied the building and without undue annoyance to personnel will be acceptable under the definition of Substantial Completion. It shall also include major final cleaning required under the Contract, removal of all surplus equipment and material not required for completion or remaining work, and the placement of remaining materials and equipment in convenient locations as approved by the Owner.

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 the date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must 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 the publication source and make them available on request.

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:
1. Water service and distribution.
2. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
3. Heating and cooling facilities.
4. Ventilation.
5. Electric power service.
6. Lighting.
7. Telephone service.

C. Support facilities include, but are not limited to, the following:
1. Waste disposal facilities.
2. Field offices.
3. Storage and fabrication sheds.
4. Lifts and hoists.
5. Temporary elevator usage.
6. Temporary stairs.
7. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:
1. Security enclosure and lockup.
2. Temporary enclosures.
3. Temporary partitions.
4. Fire protection.

E. Related Sections include the following:
1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
3. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
1. Owner's construction forces.
2. Occupants of Project.
3. Architect.
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.

C. Electric Power Service: Use electric power from Owner's existing system without metering and without payment of use charges.

1.5 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."

C. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

D. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

E. Paint: Comply with requirements in Division 9 Section "Painting."

F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

G. Construction Fencing: Material to meet AASHTO standards.

H. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

E. Heating Equipment: Owner authorizes use of existing and permanent heating system.

F. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

G. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

H. Construction Fencing: Provide secure area with gate as shown in Construction Documents. Access must be maintained for Owner's vehicles at loading dock.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
   1. Provide rubber hoses as necessary to serve Project site.
   2. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
   3. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
   4. Provide pumps to supply a minimum of 30-psi (200-kPa) static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.

B. Sanitary Facilities: Provide temporary toilets and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
   2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
   3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

C. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F (10 deg C) in permanently enclosed portions of building for normal construction activities, and 65 deg F (18.3 deg C) for finishing activities and areas where finished Work has been installed.
2. Temporary heat shall be provided to protect all concrete and masonry work during installation as well as other trades needing specific heat requirements to perform and protect their work. See individual specification sections for detailed information.
3. Permanent air heating systems may be used to provide heat only when finishes are complete enough to eliminate construction dust. Pay for maintenance costs resulting from the use of the permanent heating system prior to "substantial completion" unless otherwise agreed to by the Owner. Extend warranty periods for such systems at the Contractor's expense so that the Owner gets the fully intended warranty period effective the day of "Substantial Completion."
4. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and replacement of filters and worn or consumed parts.

D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

E. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

F. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
1. Provide warning signs at power outlets other than 110 to 120 V.
2. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
3. Provide metal conduit enclosures or boxes for wiring devices.
4. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Provide one 100-W incandescent lamp per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination.
3. Provide one 100-W incandescent lamp every 50 feet (15 m) in traffic areas.

H. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office.
1. Provide additional telephone lines for the following:
   a. Provide a dedicated telephone line for each facsimile machine in each field office.

2. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.
3. Provide an answering machine on superintendent's telephone.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access. Coordinate locations with the Owner.
   2. Provide incombustible construction for sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
   3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
   1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
   2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

C. Contractor's Field Office: Provide field office in existing building for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 6 persons at Project site. Keep office clean and orderly.
   1. Furnish and equip office as follows:
      a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.

D. Owner Representative/Clerk of Work Field Office: Provide field office in existing building for use by Owner's Representative and the Clerk of Works.
   1. Furnish and equip each separate office as follows:
      a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
      b. Provide office with separate phone and fax machine.

E. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
   1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
   2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

F. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
   1. Protect existing window system from damage when moving materials through system.

G. Existing Elevator Usage: Use of Owner's existing freight elevator only will be permitted, as long as the elevator is cleaned and maintained in a condition acceptable to Owner.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.

H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.
   2. Use stair A only for access to and from fifth, sixth and seventh floors. Use stair B for access to all floors.

I. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
   1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated on the sketch attached at the end of this section.
   2. Prepare temporary signs to provide directional information to construction personnel and visitors.
   3. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
   4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of

noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
2. Vertical Openings: Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.

D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Construct dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16-mm) gypsum wallboard with joints taped on occupied side, and 1/2-inch (13-mm) fire-retardant plywood on construction side.
   a. Partitions at elevator lobbies: Paint gypsum wallboard side to match finish of occupied areas. Install vinyl base to match existing occupied areas.
2. Insulate partitions to provide noise protection to occupied areas.
3. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
4. Protect air-handling equipment.
5. Weatherstrip openings.

E. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
8. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
   a. Existing systems may be utilized.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION 01500

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
1. Division 1 Section "Allowances" for products selected under an allowance.
2. Division 1 Section "Alternates" for products selected under an alternate.
3. Division 1 Section "References" for applicable industry standards for products specified.
4. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
5. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided at end of Section.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
      i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
      j. Cost information, including a proposal of change, if any, in the Contract Sum.
      k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.

1. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within three days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution by addendum.
   a. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated or notification is not made by addendum.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures" and the previous paragraph on Substitution Requests.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Products with asbestos: Asbestos containing materials are not to be purchased or installed in this project.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
   5. Store products to allow for inspection and measurement of quantity or counting of units.
   6. Store materials in a manner that will not endanger Project structure.
   7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   9. Protect stored products from damage.

a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
11. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within the time indicated in Section 00100 – Instructions to Bidders.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    2. Requested substitution does not require extensive revisions to the Contract Documents.
    3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    4. Substitution request is fully documented and properly submitted.
    5. Requested substitution will not adversely affect Contractor's Construction Schedule.
    6. Requested substitution has received necessary approvals of authorities having jurisdiction.
    7. Requested substitution is compatible with other portions of the Work.
    8. Requested substitution has been coordinated with other portions of the Work.
    9. Requested substitution provides specified warranty.
    10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

SUBSTITUTION REQUEST FORM

Project:_____ Substitution Request Number:_____.
To:_____ From:_____.
Re:_____ Date: _____.

Specification Title: _____ Description: _____.
Section: _____Page: _____Article/Paragraph: _____.

Proposed Substitution: _____.
Manufacturer:_____Address:_____Phone:_____.
Trade Name:_____Model No._____.

Attached data includes product description, specifications, drawings, and performance and test data adequate for evaluation of the request: applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitutions will require for its proper installation.

The Undersigned certifies:

1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waive claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with substitution.

Submitted By:_____.
Signed By:_____.
Firm:_____.
Address:_____.
Telephone:_____Fax:_____.

A/E's REVIEW AND ACTION

___Submission approved - Make submittals in accordance with Specification Section 01330.
___Submission approved as noted - Make submittals in accordance with Specification Section 01330.
___Submission rejected - Use specified materials.
___Submission request received too late - Use specified materials.

Signed by:_____Date:_____.

Supporting Data Attached: ___Drawings ___Product Data ___Samples ___Tests ___Reports
___Other_____.

END OF SECTION 01600

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. General installation of products.
   3. Coordination of Owner-installed products.
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work.

B. Related Sections include the following:
   1. Division 1 Section "Submittal Procedures" for submitting surveys.
   2. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
   3. Division 1 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.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of 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 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.

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. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

B. 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.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. 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 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   1. Inform installers of lines and levels to which they must comply.
   2. Check the location, level and plumb, of every major element as the Work progresses.
   3. Notify Architect when deviations from required lines and levels exceed allowable tolerances.

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 of 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. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 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. As part of the Filed Sub-Bids, each trade shall pick up and dispose of debris and rubbish generated by that trade in the demolition of existing work.

E. For general construction, each trade shall pick up the debris and rubbish, generated by that trade, and dispose of in dumpsters furnished by the General Contractor.

F. Dispose of debris, rubbish and other materials in accordance with the applicable State, Local and Federal regulations.

G. 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.

H. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

I. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

J. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
   1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

K. 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.

L. 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.

M. 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.

N. 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.

3.6 STARTING AND ADJUSTING

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

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.7 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.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01700

SECTION 01731

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building for alterations.
2. Division 7 Section "Through-Penetration Firestop Systems" for patching fire-rated construction.
3. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
   a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Fire-protection systems.
4. Control systems.
5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
   a. Processed concrete finishes.

b. Stonework and stone masonry.
c. Ornamental metal.
d. Matched-veneer woodwork.
e. Preformed metal panels.
f. Roofing.
g. Firestopping.
h. Window wall system.
i. Wall covering.
j. HVAC enclosures, cabinets, or covers.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

SECTION 01732

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of a building.
   2. Patching and repairs.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Summary" for use of the building and phasing requirements.
   2. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
   3. Division 1 Section " Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for selective demolition operations.
   4. Division 1 Section "Closeout Procedures" for record document requirements.
   5. Division 6 Section "Rough Carpentry" for material and construction requirements for temporary enclosures.
   6. Division 9 Section "Gypsum Board Assemblies" for material and construction requirements for temporary enclosures.
   7. Division 15 Sections for cutting, patching, or relocating mechanical items.
   8. Division 16 Sections for cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

B. Proposed dust-control measures.

C. Proposed noise-control measures.

D. Schedule of selective demolition activities indicating the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
   2. Interruption of utility services.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Detailed sequence of selective demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
   6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
   7. Locations of temporary partitions and means of egress.

E. Inventory of items to be removed and salvaged.

F. Inventory of items to be removed by Owner.

G. Record drawings at Project closeout according to Division 1 Section "Closeout Procedures."
   1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of the building immediately adjacent to selective demolition area. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Asbestos: It is not expected that asbestos will be encountered in the Work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.

D. Storage or sale of removed items or materials on-site will not be permitted.

1.8 SCHEDULING

A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations.

1.9 WARRANTY

A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
      a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
   1. Owner will arrange to shut off indicated utilities when requested by Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
   4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.

C. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Conduct demolition operations and remove debris to ensure minimum interference with adjacent occupied facilities.

C. Conduct demolition operations to prevent injury to people and damage to adjacent facilities to remain. Ensure safe passage of people around selective demolition area.
   1. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

2. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
3. Cover and protect furniture, furnishings, and equipment that have not been removed.

D. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
1. Refer to Division 1 Section "Temporary Facilities and Controls" for information on constructing dustproof partitions.
2. Protect air-handling equipment.
3. Weatherstrip openings.

E. Provide and maintain interior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.

6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
9. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.

C. Remove resilient floor coverings and adhesive according to recommendations of the Resilient Floor Covering Institute's (RFCI) "Recommended Work Practices for the Removal of Resilient Floor Coverings" and Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

D. Remove no more existing roofing than can be covered in one day by new roofing. See applicable Division 7 Section for new roofing requirements.

E. Remove air-conditioning equipment without releasing refrigerants.

3.6 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Patching is specified in Division 1 Section "Cutting and Patching."

C. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.

D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

E. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance.
1. Closely match texture and finish of existing adjacent surface.
2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.

4. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
5. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.

F. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

C. Enter into a contract for the transportation and disposal of all solid waste in accordance with the applicable State, Local and Federal regulations.

3.8 CLEANING

A. Sweep the building broom clean on completion of selective demolition operation.

B. Change filters on air-handling equipment on completion of selective demolition operations.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Refer to the drawings.

END OF SECTION 01732

SECTION 01770

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 1 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. Project Record Documents.
   3. Operation and maintenance manuals.
   4. Warranties.
   5. Instruction of Owner's personnel.
   6. Final cleaning.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Division 1 Section "Construction Progress Documentation" for submitting Final Completion construction photographs and negatives.
   3. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
   4. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   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. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. 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.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. 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 1 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. Submit pest-control final inspection report and warranty.
   5. 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.

C. Re-Inspection Fees:
1. If the Architect Perform Re-inspections Due to Failure of the Work to Comply with the Claims of Status of Completion Made by the Contractor, Or, Should the Contractor fail to complete the work, Or, Should the Contractor fail to promptly correct warranty items or work later found to be deficient:
   a. Owner will compensate Architect for such additional services.
   b. Owner will deduct the amount of such compensation from the final payment to the Contractor.
2. If the Work is not completed by the date set in the agreement, and the Architect needs to perform additional Contract Administrative and on site observation duties:
   a. Owner will compensate Architect for such additional services.
   b. Owner will deduct the amount of such compensation from the final payment to the Contractor.

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, starting with exterior areas first and proceeding from lowest floor to highest floor.
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 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
1. 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 cannot be readily identified and recorded 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.

d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
3. Mark important additional information that was either shown schematically or omitted from original Drawings.
4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy 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. Note related Change Orders, Record Drawings, and Product Data, where applicable.

D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
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 Drawings, and Record Specifications, where applicable.

E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
a. Emergency instructions and procedures.
b. System, subsystem, and equipment descriptions, including operating standards.
c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
d. Description of controls and sequence of operations.
e. Piping diagrams.

2. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 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 (115-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 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. 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. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.
   5. Troubleshooting.
   6. Maintenance.
   7. Repair.

3.2 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, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.

2. Maintenance Data:
   a. Manufacturer's information, including list of spare parts.
   b. Name, address, and telephone number of Installer or supplier.
   c. Maintenance procedures.
   d. Maintenance and service schedules for preventive and routine maintenance.
   e. Maintenance record forms.
   f. Sources of spare parts and maintenance materials.
   g. Copies of maintenance service agreements.
   h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.

1.8 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 (115-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 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. 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. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
   1. System design and operational philosophy.
   2. Review of documentation.
   3. Operations.
   4. Adjustments.
   5. Troubleshooting.
   6. Maintenance.
   7. Repair.

3.2 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, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
      b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
      c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
      d. Remove tools, construction equipment, machinery, and surplus material from Project site.
      e. Remove snow and ice to provide safe access to building.

SECTION 03300

CAST-IN-PLACE CONCRETE

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 specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

A. General: Submit the following according to conditions of the Contract and Division 1 Specification Sections.

B. Concrete Mix Design: Submit proposed design mix for concrete to be used. Include the following items.

1. Mix proportions for all ingredients of the mix. Designate within the submittal where each mix is proposed to be used. Proportions shall be established by one of the following methods in accordance with ACI 301.
    a. Field experience;
    b. Trial batch;
    c. Water/cement ratios specified in this section.

2. Cement type

3. Aggregate gradations taken within (3) months from the date of submission. Specify size of coarse aggregate in accordance with ASTM size numbers.

4. Product data for all proprietary items incorporated into the mix including, but not limited to, admixtures.

5. Compressive strength results from an independent testing laboratory for mixes designed in accordance with trial batch or field experience methods.

    a. Trial batches shall be tested within (12) months from the date of submission;
    b. Submit quantity of tests in accordance with ACI 301. Note that mix designs developed in accordance with the field experience method must include a minimum of (30) consecutive tests, with an allowance for 10 to 30 consecutive tests with a higher average strength required;
    c. Slump and air content shall be consistent with specifications for this project within tolerances specified within ACI 301.

C. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, fiber reinforcement, and others if requested by the Architect

1. If curing compound is intended for use on floor slabs, submit certification attesting to curing compound's compatibility with the successive floor treatments scheduled for this project.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing and tie spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.

F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: If the trial batch method is used to design concrete mixes, testing shall be performed by an independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318, "Building Code Requirements for structural Concrete."
4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Notify the structural engineer of record at least (7) days prior to scheduling the conference. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixes.
c. Ready-mix concrete producer.
d. Concrete subcontractor.
e. Structural engineer of record.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spilling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

D. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according

to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, Type II, or Type I/II.

1. Fly Ash: ASTM C 618, Class C or F.
2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Lightweight Aggregate: ASTM C 330.

1. Nominal Maximum Aggregate Size: 3/4 inch (19 mm).

C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.6 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

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. Fibrillated Fibers:

1. Fibrasol F; Axim Concrete Technologies.
2. Fibermesh; Fibermesh, Div. of Synthetic Industries.
3. Forta; Forta Corporation.
4. Grace Fibers; W. R. Grace & Co., Construction Products Div.

b. Monofilament Fibers:

1. Fibrasol IIP; Axim Concrete Technologies.
2. Fiberstrand 100; Euclid Chemical Co.
3. Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
4. Forta Mono; Forta Corporation.
5. Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
6. Hi-Tech PPM Fiber; Hi-Tech Fibers, Div. of Martin Color-Fi, Inc.
7. Polystrand 1000; Metalcrete Industries.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Evaporation Retarder:

a. Cimfilm; Axim Concrete Technologies.
b. Finishing Aid Concentrate; Burke Group, LLC (The).
c. Spray-Film; ChemMasters.
d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
e. Sure Film; Dayton Superior Corporation.
f. Eucobar; Euclid Chemical Co.
g. Vapor Aid; Kaufman Products, Inc.
h. Lambco Skin; Lambert Corporation.

i. E-Con; L&M Construction Chemicals, Inc.
j. Confilm; Master Builders, Inc.
k. Waterhold; Metalcrete Industries.
l. Rich Film; Richmond Screw Anchor Co.
m. SikaFilm; Sika Corporation.
n. Finishing Aid; Symons Corporation.
o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.

2. Clear, Waterborne, Membrane-Forming Curing Compound:

a. AH Clear Cure WB; Anti-Hydro International, Inc.
b. Klear Kote WB II Regular; Burke Chemicals.
c. Safe-Cure & Seal 20; ChemMasters.
d. High Seal; Conspec Marketing & Manufacturing Co., Inc.
e. Safe Cure and Seal; Dayton Superior Corporation.
f. Aqua Cure VOX; Euclid Chemical Co.
g. Cure & Seal 309 Emulsion; Kaufman Products Inc.
h. Glazecote Sealer-20; Lambert Corporation.
i. Dress & Seal WB; L&M Construction Chemicals, Inc.
j. Vocomp-20; W. R. Meadows, Inc.
k. Metcure; Metalcrete Industries.
l. Cure & Seal 150E; Nox-Crete Products Group, Kinsman Corporation.
m. Rich Seal 14 percent E; Richmond Screw Anchor Co.
n. Kure-N-Seal WB; Sonneborn, Div. of ChemRex, Inc.
o. Florseal W.B.; Sternson Group.
p. Cure & Seal 14 percent E; Symons Corporation.
q. Seal Cure WB 150; Tamms Industries Co., Div. of LaPorte Construction Chemicals of North America, Inc.
r. Hydro Seal; Unitex.
s. Starseal 309; Vexcon Chemicals, Inc.

2.8 RELATED MATERIALS

A. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).

1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test databases, as follows:

1. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. When acceptable data is not available for either field experience or trail batch design methods, provide normal weight concrete with the following properties:

1. 4000-psi, 28-day compressive strength; water-cement ratio, 0.44 maximum (non-air-entrained), 0.35 maximum (air-entrained).

D. Suspended Slabs and Toppings: Proportion lightweight structural concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).

2. Calculated Equilibrium Unit Weight: 115 lb/cu. ft. (1842 kg/cu. m) plus or minus 3 lb/cu. ft. (48.1 kg/cu. m) as determined by ASTM C 567.
3. Maximum Slump: 4 inches (100 mm).
4. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches (200 mm) after admixture is added to concrete with 2- to 4-inch (50- to 100-mm) slump.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

F. Air Content: Air entrainment is not required for concrete performance. It is acceptable to provide air entrained concrete if desirable to attain the specified unit weight or required workability.

G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.90 kg/cu. m).

H. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information. Clearly indicate on the batch ticket the time at which the cement was added to the mix.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
2. Mixing time will be measured from the time the cement is added to the mix.

B. Project-Site Mixing: Project-site mixing is not permitted.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class B, 1/4 inch (6 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

1. Support welded wire fabric on chairs or other approved methods. The use of lifting hooks to set the position of welded wire fabric is prohibited.
2. At elevated slabs with structural steel supports, locate supports for welded wire fabric directly over steel framing, with intermediate supports between framing as required to maintain specified tolerances.

3.4 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Elevated Slabs on Metal Deck: Locate construction joints at midspan between structural steel framing. Provide dowels at mid-depth, #4, 2 feet, 6 inches long, at 24 inches on center. Welded wire fabric shall be continuous through construction joints.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
3. Maintain a minimum of two working vibrators on the project during each concrete placement.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Placing Concrete Toppings: Where an area is indicated on the drawings to be infilled with concrete, install as follows:

1. Remove all debris, lose material, and laitance from the surface.
2. Complete surface preparation in accordance with specifications by the manufacturer of the bonding agent.
3. Apply proprietary bonding agent. Methods and rate of application shall be in accordance with the manufacturer's specifications. Apply bonding agent to all surfaces where new concrete will abut to existing.
4. If a topping is placed over an existing concrete surface with a construction joint, install a construction joint in the topping to align with the existing joint.
5. At areas indicated, fill to be flush with adjacent, existing surfaces. Finish all new concrete surfaces as specified herein for "Finishing Floors and Slabs."

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as painting.
2. Do not apply rubbed finish to smooth-formed finish.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to all floor surfaces.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to all floor surfaces.
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3.6 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as painting.
2. Do not apply rubbed finish to smooth-formed finish.

3.7 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to all floor surfaces.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to all floor surfaces.
2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 25; and levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and levelness, F(L) 15.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Cure concrete surfaces to receive floor coverings with either a moisture curing, moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Do not apply a curing compound where its presence will inhibit the bond of successive floor treatments.

3.10 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler in construction joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

SECTION 05120

STRUCTURAL STEEL

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 structural steel.

Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Quality Control Measures" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Deck" for field installation of shear connectors.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

1. Connection design is subject to review and approval by the Structural Engineer of Record

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product used in structural steel fabrication and erection including, but not limited to primer paint, slide bearings, non-shrink grout, and anchorage devices.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Provide details required for proper erection of fabricator-designed connections.

H. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain, uncoated.

I. Direct-Tension Indicators: ASTM F 959, Type 325.

1. Finish: Plain, uncoated.

J. Welding Electrodes: Comply with AWS requirements.

K. Expansion Bolts: Wedge anchor appropriate for solid masonry or concrete of size as noted on the drawings, or if not noted, as required to withstand required loading. Acceptable products include, but are not limited to, the following.

1. Hilti Kwik-Bolt II Stud Anchors
2. Red Head Wedge Anchors
3. Rawl Power-Fast Anchors
4. Fastenal Stud Anchors

L. Adhesive Anchors: Threaded anchors with a chemical capsule containing premeasured amounts of liquid polyester resin, quartz aggregate and a catalyst. Size and embedment depth shall be as noted on the drawings, or if not noted, as required to withstand re2uired loading. Acceptable products include, but are not limited to, the following:

1. Hilti HY 150 Adhesive Anchors
2. Rawl Power-Fast Anchor System

2.2 PRIMER

A. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
   a. 100 Non-Shrink Grout (Non-Metallic); Conspec, Inc.
   b. Supreme Grout; Cormix, Inc.
   c. Sure Grip Grout; Dayton Superior

d. Euco N.S.; Euclid Chemical Co.
e. Crystex; L & M Construction Chemicals, Inc.
f. Masterflow 713; Master Builders
g. Sealtight 588 Grout; W.R. Meadows
h. Propak; Protex Industries, Inc.
i. Set Non-Shrink; Set Products, Inc.
j. Five Star Grout; U.S. Grout Corp.

2.4 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 (ASTM A 6M) and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

D. Shear Connectors and Deformed Bar Anchors: Prepare steel surfaces as recommended by manufacturer. Use automatic end welding according to AWS D1.1 and manufacturer's printed instructions.

E. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" or "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.

2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

2.6 SHOP PRIMING

A. All interior structural steel is scheduled to receive sprayed-on fireproofing. All exterior structural steel is specified to be galvanized. There will be no shop priming of structural steel for this project.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123.

B. Exterior steel shall be hot dipped galvanized.

2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" or "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrant Inspection: ASTM E 165.
2. Ultrasonic Inspection: ASTM E 164.

F. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete bearing surfaces and locations of anchorages for compliance with requirements.

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

3.2 PREPARATION

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

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

   a. Comply with manufacturer's instructions for proprietary grout materials and anchorage devices.

4. Alternatively, 1/4" thick leveling plates, with plan dimensions equal to the specified base or bearing plates, may be set on non-shrink grout. Leveling plates shall bear uniformly on nonshrink grout with the required anchor bolts projecting through them and with the top surface level in all directions. Base and bearing plates will then be set directly on the leveling plate. Tighten anchor bolts after all members are set in their final position and plumb.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

   1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection, unless specifically approved by the Structural Engineer of Record.

G. If approved finish sections thermally cut during erection equal to a sheared appearance.

H. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" or "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

   1. Bolts: ASTM A 325 (ASTM A 325M) high-strength bolts, unless otherwise indicated.
   2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

   1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

3.5 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" or "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.

1. Liquid Penetrant Inspection: ASTM E 165.
2. Ultrasonic Inspection: ASTM E 164.

F. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.6 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.038 mm).

END OF SECTION 05120

SECTION 05310

STEEL DECK

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. Composite floor deck.

B. Related Sections include the following:

1. Division 3 Section "Cast-in-Place Concrete" for concrete fill and reinforcing steel.
2. Division 5 Section "Structural Steel" for shop-welded shear connectors.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, deck openings, special jointing, accessories, and attachments to other construction.

1. Provide a layout drawing indicating spacing for shear connectors for composite slabs. Show spacing, coordinated with layout of steel deck ribs.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed steel deck similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those steel deck units tested for fire resistance per ASTM E 119 by a testing and inspection agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Calculate structural characteristics of steel deck according to AISI's "Specification for the Design of Cold-Formed Steel Structural Members."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Steel Deck:

a. BHP Steel Building Products USA Inc.
b. Consolidated Systems, Inc.
c. Epic Metals Corp.
d. Marlyn Steel Products, Inc.
e. Nucor Corp.; Vulcraft Div.
f. Roof Deck, Inc.
g. United Steel Deck, Inc.
h. Verco Manufacturing Co.
i. Wheeling Corrugating Co.; Div. of Wheeling-Pittsburgh Steel Corp.

2.2 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 29, the minimum section properties indicated, and the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Profile Depth: 1-1/2 inches (38 mm).
3. Design Uncoated-Steel Thickness: 0.0295 inch (0.75 mm).
4. Span Condition: Triple span or more.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8 mm) minimum diameter.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Steel Sheet Accessories: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile 95 indicated on the drawings, or if not indicated, as recommended by SDI Publication No. 29 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arc shields.

I. Galvanizing Repair Paint: ASTM A 780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 29, manufacturer's written instructions, and requirements in this Section.

B. Locate decking bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-laps.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to decking.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work.

G. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds 12 inches (305 mm) on center.

B. Side-Lap Fastening: Fasten side laps of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches (910 mm), and as follows:

1. Mechanically fasten with self-drilling No. 10 (4.8-mm-) diameter or larger carbon-steel screws.

C. Perimeter Edge Fastening Parallel to the Deck Span: Fasten perimeter edges parallel to the deck span with 5/8 inch (16 mm) diameter welds at 12 inches on center.

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Butted

E. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.

1. Where shear connector welds engage deck, that weld may serve as deck attachment.

F.. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

G. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of decking. Weld cover plates at changes in direction of floor deck panels, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field welds will be subject to inspection.

C. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:

1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Remove and replace work that does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05500

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Loose bearing and leveling plates.
2. Support angles for elevator door sills.
3. Traffic door frames.
4. Elevator machine beams.
5. Steel grating.
6. Steel framing and supports for mechanical and electrical equipment.
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Related Sections include the following:
1. Division 5 Section "Structural Steel" for structural-steel framing system components.

1.3 SUBMITTALS

A. Product Data: For the following:
1. Paint products, steel grating.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."
   3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. Steel Bars for Gratings: ASTM A 36/A 36M.

E. Wire Rod for Grating Crossbars: ASTM A 510 (ASTM A 510M).

F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primers: Provide primers that are compatible with finish paints specified in Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal:

1. For exterior applications provide an organic zinc-rich primer complying with SSPC Print 20 and compatible with topcoat. Subject to compliance with requirements, provide one of the following
   a. Carboline 621; Carboline Company.
   b. Aquapon Zinc-Rich Primer 97-670; PPG Industries, Inc.

2. For interior applications, provide Carboline AD29 Primer or an approved equal.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Hilti Kwik-Bolt Stud Anchors
      b. Red Head Wedge Anchors
      c. Rawl Power-Fast Anchors
      d. Fastenal Stud Anchors

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

K. Adhesive Anchors: Threaded anchors with a chemical capsule containing prepared amounts of liquid polyester resin, quartz aggregate, and a catalyst. Size and embedment depth shall be as noted on the drawings, or if not noted, as required to withstand required loading. Acceptable products include, but are not limited to:
   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. Hilti HVA Adhesive Anchors
      b. Red Head Redi-Chem Anchors
      c. Rawl Needle-Capsule Anchors System
      d. Fastenal Chemical Capsule Anchors

L. Sleeve Anchors: Hilti with Hex Nut (HX). Provide tamperproof nut as indicated.

M. Renovation Anchors: Hilti, HIT C-20 system, female type.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION, GENERAL

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

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

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

H. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

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

J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.7 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.8 STEEL GRATING

A. Grating Platforms: Form to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual for Steel Stainless Steel, and Aluminum Gratings and Stair Treads."
1. Fabricate platforms from welded steel grating with 1-1/4-by-1/8-inch (32-by-3-mm) bearing bars at 1-3/16 inch (30 mm) o.c. and crossbars at 4 inches (100 mm) o.c., NAAMM designation: W-19-4 (1-1/4 x 1/8) STEEL.
2. Fabricate grating platform with steel angle or steel plate carrier at each end for connections.

2.9 TRAFFIC DOOR FRAMES

A. Fabricate steel door frames from structural shapes and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch (16-by-38-mm) steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches (250 mm) o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

B. Provide steel strap anchors, 1/8 by 2 inches (3 by 50 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, unless otherwise indicated, for securing door frames into adjoining concrete or masonry. Weld anchors to frame jambs no more than 12 inches (300 mm) from both bottom and head of frame, and space anchors not more than 30 inches (750 mm) apart.

C. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
   2. Furnish inserts if units must be installed after concrete is placed.

2.11 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

A. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonshrink, nonmetallic grout, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

C. Where bearing plates are indicated with integral anchors, set in cement grout while grout is fluid. Level the surface and provide temporary support while grout hardens. Do not force anchors in partially hardened grout.
   1. Where non-shrink grout is indicated, pack between bearing surfaces as indicated above.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
   1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

END OF SECTION 05500

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking and nailers.
   3. Plywood backing panels.

B. Related Sections include the following:
   1. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

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

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NELMA - Northeastern Lumber Manufacturers Association.
   2. NLGA - National Lumber Grades Authority.
   3. RIS - Redwood Inspection Service.
   4. SPIB - Southern Pine Inspection Bureau.
   5. WCLIB - West Coast Lumber Inspection Bureau.
   6. WWPA - Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. 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.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.
5. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood Structural Panels:
1. Plywood: DOC PS 1.
2. Oriented Strand Board: DOC PS 2.
3. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
4. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and the following:
a. Chromated copper arsenate (CCA).
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:
   1. Rooftop equipment bases and support curbs.
   2. Blocking.
   3. Nailers.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:
   1. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.4 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4 inch (19 mm) thick.

2.5 FASTENERS

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

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: Hilti Kwik-Flex or Elco Dril-Flex; no substitutes, 10-24 x 1-1/4 inch wafer head #3.

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.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

C. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2305.2, "Fastening Schedule," in the BOCA National Building Code.

D. 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; predrill as required.

E. Use finishing nails for exposed work, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated 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. Build anchor bolts into masonry during installation of masonry work. Where possible, secure anchor bolts to formwork before concrete placement.

END OF SECTION 06100

SECTION 06402

INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Interior standing and running trim.
2. Wood door frames.
3. Wood cabinets.
4. Plastic-laminate cabinets.
5. Plastic-laminate countertops.
6. Open shelving.
7. Shop finishing interior woodwork.

B. Related Sections include the following:
1. Division 6 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 8 Section "Flush Wood Doors."
3. Division 16 Section "Interior Lighting Fixtures" for lights to be installed in cabinets.

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. Product Data: For medium-density fiberboard, particleboard, plywood, high-pressure decorative laminate, adhesive for bonding plastic laminate, thermoset decorative overlay, cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
1. Show details full size.

E. Clear Tempered Glass for Doors: ASTM C 1048, Kind FT, UV/IR filtered, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

F. Clear Tempered Glass for Shelves: ASTM C 1048, Kind FT, with exposed edges seamed before tempering, 10 mm thick, unless otherwise indicated.

G. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include the following:
      a. Formica Corporation
      b. Wilsonart International; Div. of Premark International, Inc.
      c. Pionite
      d. Nevamar

H. Adhesive for Bonding Plastic Laminate: Contact cement.

2.2 INTERIOR STANDING AND RUNNING TRIM

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
   1. Clear, kiln-dried, American cherry finished lumber (S4S), selected for compatible grain and color.
   2. Texture: Surfaced (smooth).
   3. Solid lumber stock.

2.3 WOOD DOOR FRAMES

A. Frames, fabricated from cherry, machined for 1-3/4 inch thick door, clear material, to accommodate wall thickness indicated.
   1. Rabbeted Jamb: Provide 1-1/4 inch thick, double rabbeted jamb.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by referencing BHMA numbers or items referenced to this standard.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening, self-closing.
   1. Grass 1003.
   2. MEPLA SSP 03-254-599.

D. Wire Pulls: Back mounted, 4 inches (100 mm) long, 5/16 inches (8 mm) in diameter. Solid aluminum with finish as indicated below.

E. Shelf Rests:
1. Knape & Vogt Mfg. Co.: No. 255 nickel finish, 5/8" wide by 3/16" high Standards for shelving in casework, recess mount on 2" centers. Brackets shall be No. 256 series with nickel finish.

F. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, 100 pound capacity, baked-on epoxy finish:
1. Grass 6200.
2. MEPLA 3211.

G. Drawer and Door Locks: Cylindrical type, 5-pin tumbler and cam, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.
1. Provide minimum of 2 keys per lock and 6 master keys.
2. Provide where indicated.

H. Grommets for Cable Passage through Countertops: 3-inch (75-mm) OD, molded-plastic grommets and matching plastic caps with slot for wire passage. Color as selected by Architect.
1. Product: Subject to compliance with requirements, provide No. 35-3" by Outwater Plastics, Woodridge, NJ, (800) 631-8375.

I. Metal Support Cables: Support cable system "Maxi Cable" by Shop Kit Designs Limited. (www.shopkit.com)
1. Cable: 3 mm stainless steel cable.
2. Connectors: Anodized aluminum with set screws for anchoring cable.
3. Accessories:
   a. Glass Shelf Holder.
   b. Literature Holder.
   c. Poster Holder.
4. Provide model numbers for components and accessories as shown on the drawings.

J. Wire Mesh: .063 inch (1.6 mm) stainless steel wire cloth, 3/4 inch (19 mm) square opening.
1. Available Manufacturer: Cleveland Wire.

K. 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.
2. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 INSTALLATION 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.

2.6 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide Custom and Premium grade interior woodwork complying with the 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. Back out or kerf backs of the following members, except members with ends exposed in finished work:
   1. Interior standing and running trim, except shoe and crown molds.
   2. Wood door frames.

D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
   2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
   3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).

E. Complete fabrication, including assembly, 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. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. 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.

F. 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.

G. Install glass to comply with applicable requirements in Division 8 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.7 WOOD CABINETS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.

B. Grade: Premium.

C. AWI Type of Cabinet Construction:
1. Flush overlay without face frame.
2. Reveal overlay with face frame.

D. Wood Species and Cut for Exposed Surfaces:
1. American Cherry, kiln dried, selected for compatible grain and color.
2. Red oak, kiln dried, selected for compatible grain and color.
3. American Cherry veneer particleboard or medium density fiberboard (MDF).
4. Red oak veneer particleboard or medium density fiberboard (MDF).
5. Grain: Run and match grain vertically for fixed panels.
6. Matching of Veneer Leaves: Book match.
7. Vertical Matching of Veneer Leaves: End match.
8. Veneer Matching within Panel Faces: Balance and Center match.
9. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

E. Semi-Exposed Surfaces:
1. Surfaces Other than Drawer Bodies: Thermoset Decorative Overlay (melamine).
2. Drawer Sides and Backs: 1/2" baltic birch plywood or solid lumber.
3. Drawer Bottoms: 1/4" hardboard.

2.8 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Grade: Custom.

C. AWI Type of Cabinet Construction: Flush overlay without face frame.

D. Cladding for Surfaces: High-pressure decorative laminate complying with the following requirements:
1. Body members - ends, bottom, divisions, rails and tops: .028" laminate over 3/4 inch thick Thermoset Decorative Overlay (melamine) with laminate edging, all exposed and semi-exposed sides.
2. Shelves: 3/4 inch thick Thermoset Decorative Overlay (melamine) with laminate edging. Provide laminate over plywood where required to meet AWI 400-G-8.
3. Backs: 1/2 inch thick Thermoset Decorative Overlay (melamine).
4. Drawer sides, backs and subfronts: 1/2" baltic birch plywood or solid lumber.
5. Drawer Bottoms: 1/4" hardboard.
6. Drawer Fronts: .028" laminate over 3/4 inch thick Thermoset Decorative Overlay (melamine) with laminate edging.

7. Cabinet Doors: .028" laminate over 3/4 inch thick Thermoset Decorative Overlay (melamine) with laminate edging.
8. Edging: Band all exposed edges with .028" laminate.
9. Base Toe Kick: Hardwood plywood.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Provide Architect's selections from laminate manufacturer's full range of colors and finishes in the following categories:
a. Solid colors.
b. Patterns.

F. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.9 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: Premium.

C. High-Pressure Decorative Laminate Grade: HGS, nominal thickness .048" (1.2 mm).

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:
a. Solid colors.
b. Patterns.

E. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: As indicated on the drawings.

G. Core Material: Particleboard.

H. Core Material at Sinks: Particleboard made with exterior glue.

2.10 POST-FORMED COUNTERTOPS

A. Post-formed Countertops: HGP, nominal thickness .038" (1.0 mm), phenolic resin particleboard with .020" phenolic backer sheet. Provide Postform #290 Euro-Edged design with 3/8 inch radius edges and 3/16 inch radius coves.
1. Application: Counters in bathrooms only.

2.11 OPEN WALL SHELVING

A. Thermoset Decorative Overlay (melamine) shelves with wood edging, 3/4 inch thick unless noted otherwise.

B. Wall Brackets: Knape & Vogt No. 85 ANO, twin slotted standards with No. 185 brackets.

2.12 SHOP FINISHING

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
1. 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. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523:
1. Grade: Premium.
2. AWI Finish System TR-4: Conversion varnish.
3. Staining: Match Architect's sample.
4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
5. Sheen: Satin, 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

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. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

SECTION 07530

SINGLE-PLY MEMBRANE ROOFING REPAIRS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Cut and patch existing adhered EPDM roofing and flashings and as required to install new work under this contract. Obtain information about existing system from Owner's records and from field inspection.

B. Wood nailers, blocking, and other related items are specified in Section 6 "Rough Carpentry".

1.03 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data, installation instructions, and general recommendations from manufacturer of single-ply membrane system for types of roofing required. Include data substantiating that materials comply with requirements.

C. Shop drawings showing roof configuration with repair locations indicated.

D. Certification that materials comply with local VOC limitations.

1.04 QUALITY ASSURANCE

A. Manufacturer: Obtain primary single-ply membrane roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

B. Verify existing roof warranty with Owner. Repairs to existing roofs under warranty must comply with manufacturers requirements to maintain original warranty. Original manufacturer of primary roof products shall give the Owner a letter approving repairs and verifying continuation of original warranty.

C. Installer: Engage an experienced Installer that has specialized in installing roofing systems similar in both size and type to those required for this Project for not less than 3 years. Installer must be acceptable to or licensed by manufacturer of primary roofing material.

1. Work associated with single-ply membrane roofing, including (but not limited to) insulation, flashing, and membrane sheet joint sealers, is to be performed by Installer of this Work.

D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. UL Listing: Provide labeled materials that have been tested and listed by UL in "Building Materials Directory" for application indicated, with "Class A" rated materials/system.

F. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing and inspecting agency per method indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface Burning Characteristics: ASTM E 84.

2. Fire Resistance Ratings: ASTM E 119.

3. Combustibility Characteristics: ASTM E 136.

1.05 PROJECT CONDITIONS

A. Weather: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition.

PART 2 - PRODUCTS

2.01 GENERAL

A. Performance: Provide roofing materials identified to be of generic type indicated and tested to show compliance with required performances.

B. Compatibility: Provide products recommended by manufacturers to be fully compatible with indicated substrates. Provide separation materials as required to eliminate contact between incompatible materials.

2.02 EPDM MEMBRANE

A. General: Ethylene propylene diene monomers formed into uniform, flexible sheets, complying with ASTM D 4637, Type 1.

1. Class U: Unreinforced to match existing.
2. Thickness: Match existing.
3. Exposed Face Color: Match existing.

2.03 AUXILIARY MATERIALS

A. Protection Board: 1/2" thick, high density wood fiberboard with asphalt coated face, if required to match existing installation.

B. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.

C. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.

D. Flashing Material: Manufacturer's standard system compatible with single-ply membrane.

E. Slip Sheet: Type recommended by membrane manufacturer for protecting membrane from incompatible substrates.

F. Stack Pipe Flashing: Manufacturer's standard one-piece, self-sealing flashing sized to vent pipe diameter.

G. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand minimum 90-psf uplift force.

1. Provide adhesives that comply with local requirements limiting amounts of volatile organic compounds.

2.04 INSULATING MATERIALS

A. General: Provide insulating materials matching existing to comply with requirements indicated for materials and with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.

2.05 AUXILIARY INSULATION MATERIALS

A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire-resistance requirements.

B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints and filling voids.

C. Provide system tested and approved for I-90 wind-uplift rating.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect surfaces to which roofing and flashing are to be applied. Do not proceed with installation of insulation and roofing if conditions exist which may compromise the performance of the roofing system. Beginning work on the roofing and flashing shall constitute acceptance of the surfaces as being satisfactory for the installation of the work.

3.02 CUTTING OF ROOFING, AND TEMPORARY PROTECTION

A. Neatly cut the existing roof materials in conformance with the provisions of Section 01045 Cutting and Patching, using methods which are least likely to damage adjacent roofing construction to be retained or adjoining construction.

B. Temporary weather protection, and structural cover over roof openings are specified in Section 01500, Construction Facilities and Temporary Controls.

C. Take precautions necessary to prevent clogging of drains, gutters and conductor heads.

3.03 INSTALLING INSULATION

A. Install as required to complete cutting and patching of existing roofing.

B. Cut existing insulation neatly, in straight lines, with cuts perpendicular to surface of insulation.

C. Extend new insulation full thickness over entire surface to be insulated. When patching, maintain roof slope; do not create offset between new insulation and adjacent existing insulation. Cut and fit insulation tightly around obstructions to provide a continuous thermal barrier. Butt joints loosely (no more than 1/4" gap between boards).

1. If existing insulation is mechanically fastened to deck, secure new insulation to deck with mechanical anchors of same type and with same spacing; but in no case provide less than one anchor per 4 sq. ft. of surface area or less anchorage than required by FM Loss Prevention Data Sheet 1-28. Locate anchors so they penetrate the top flute.

2. If existing insulation is loose-laid, set insulation units loose or with spot adhesives to secure them temporarily until ballast is in place, and over immediately with loose membrane.

3. If insulation is installed in more than one layer, comply with insulation manufacturer's recommendations for minimum thickness of lower layer to span deck flutes.

D. If there is a protection sheet between insulation and membrane in the existing installation, extend the protection sheet over new insulation.

3.04 INSTALLING MEMBRANE, GENERAL

A. General: Start installation only in presence of manufacturer's technical representative.

B. Strictly adhere to the approved Manufacturer's specifications for installation.

C. Before installing membrane, remove water, ice, dirt, debris, oil deposits etc. using appropriate cleaning methods. Do not install insulation or roofing over wet or dirty substrates. Remove sharp projections, sweep off loose material immediately before beginning work.

D. Unroll membrane and allow it to relax before splicing.

E. Splicing Seams: Splice seams at laps using inseam sealant and splicing cement. Clean seams with solvent (splice cleaner) before applying the sealant and cement, using clean cotton cloths for

wiping the seams; discard cloths as soon as they are soiled. Allow seams to dry. Apply a continuous bead of inseam sealant along the edge of the underneath membrane, on its upper surface (which will be in contact with the upper layer of membrane). Apply splicing cement to both faces at the lap and, after the cement has set up, roll the seam firmly with a steel roller to effect complete bond. After splice has cured, inspect for good bonding and repair if necessary.

1. When patching, clean existing membrane scrupulously, and lap new membrane over old at least 3 inches as splice. Comply with membrane manufacturer's instructions for cleaning old membrane; requirements are more stringent than cleaning of new membrane.

F. Lap Sealant: Clean seam edges and apply a continuous bead of lap sealant 5/16" wide and feathered to completely cover the splice edge.

G. Perimeter Securement: Secure membrane in accordance with roofing membrane manufacturers instructions.

H. Flashing and Vertical Terminations: Comply with manufacturer's standard details, matching existing installation. Make watertight.

I. Cut out and repair membrane defects at the end of each day's work.

J. Install water cut-offs at end of each day's work. Cover exposed insulation. Install temporary flashings where required for weather protection. Seal edges. Remove water cut-offs and temporary flashings immediately before resuming work.

3.05 FULLY ADHERED MEMBRANE

A. Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Treat seams with special adhesive and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.

3.06 PROTECTING ROOFING

A. After completing roofing (including associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At the end of the construction period, or at a time when remaining construction will in no way affect or endanger roofing, make a final inspection of roofing and prepare a written report to Owner, describing nature and extent of deterioration or damage found.

B. Repair or replace (as required) deteriorated or defective work found at the time of final inspection to a condition free of damage and deterioration at the time of Substantial Completion and according to the requirements of the specified warranty.

END OF SECTION 07530

SECTION 07811

SPRAYED FIRE-RESISTIVE MATERIALS

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. Concealed sprayed fire-resistive materials.
   2. Exposed sprayed fire-resistive materials.

B. Related Sections include the following:
   1. Division 5 Section "Structural Steel" for surface conditions required for structural steel receiving sprayed fire-resistive materials.
   2. Division 7 Section "Through-Penetration Firestop Systems" for through-penetration firestopping systems.

1.3 DEFINITIONS

A. Concealed sprayed fire-resistive material is applied to surfaces that are concealed from view behind other construction when the Work is completed.

B. Exposed sprayed fire-resistive material is applied to surfaces that are exposed to view when the Work is completed and surfaces that are accessible through acoustical panel ceilings.

1.4 SUBMITTALS

A. Product Data: For each fire-resistive product specified.

B. Shop Drawings: Structural framing plans indicating the following:
   1. Locations and types of surface preparations required before applying sprayed fire-resistive material.
   2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:
      a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
      b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
   3. Treatment of sprayed fire-resistive material after application.

C. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Compatibility and Adhesion Test Reports: For primers and other coatings applied to structural steel. Provide reports from a qualified independent testing and inspecting agency engaged by Contractor. Confirm that primers and coatings proposed for application in shop or field are compatible with fire-resistive material. Instruct laboratory to determine compatibility according to requirements specified in "Quality Assurance" Article.

F. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Testing Agency Qualifications: An independent testing and inspecting agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 699.

C. Testing of Fire-Resistive Materials: By a qualified testing and inspecting agency engaged by Contractor or manufacturer according to the following requirements:
   1. Sprayed fire-resistive materials are randomly selected for testing from bags bearing the applicable classification marking of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Testing is performed on specimens of sprayed fire-resistive materials that comply with laboratory testing requirements specified in Part 2 and are otherwise identical to installed fire-resistive materials, including application of accelerant, sealers, topcoats, tamping, troweling, rolling, and water overspray, if any of these are used in final application.
   3. Testing is performed on specimens whose application the independent testing and inspecting agency witnessed during preparation and conditioning. Include in test reports a full description of preparation and conditioning of laboratory test specimens.

D. Testing for Compatibility and Adhesion: Engage a qualified testing and inspecting agency to prepare compatibility and adhesion test reports required in "Submittals" Article based on testing that complies with the following requirements:
   1. Testing for bond per ASTM E 736 and requirements specified in UL's "Fire Resistance Directory" about coating materials.

2. Verify that manufacturer of fire-resistive material has not found primers or coatings to be incompatible with fire-resistive material based on its own laboratory testing or field experience.

E. Source Limitations: Obtain each type of sprayed fire-resistive material from one source and by a single manufacturer.

F. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials and assemblies identical to those tested for the following fire-test-response characteristics per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify packages (bags) containing sprayed fire-resistive material with appropriate markings of applicable testing and inspecting agency.
1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL's "Fire Resistance Directory," or in the comparable publication of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection, tested per ASTM E 119.
2. Surface-Burning Characteristics: As indicated for each sprayed fire-resistive product required, tested per ASTM E 84.

G. Provide products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F (4 deg C) or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material. Use natural means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 SEQUENCING

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:
   1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.
   2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
   3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
   4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
   5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
   6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.

1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.
   1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.
   2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated in this Article for material composition and physical properties representative of installed products.

B. Material Composition: As follows:
   1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

C. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed as follows:
   1. Dry Density: 15 lb/cu. ft. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."
   2. Thickness: Provide minimum average thickness required for fire-resistive design indicated according to the following criteria, but not less than 0.375 inch (9 mm), per ASTM E 605.
      a. Where the referenced fire-resistive design lists a thickness of 1 inch (25 mm) or greater, the minimum allowable individual thickness of sprayed fire-resistive material is the design thickness minus 0.25 inch (6 mm).
      b. Where the referenced fire-resistive design lists a thickness of less than 1 inch (25 mm) but more than 0.375 inch (9 mm), the minimum allowable individual thickness of sprayed fire-resistive material is the greater of 0.375 inch (9 mm) or 75 percent of the design thickness.
      c. No reduction in average thickness is permitted for those fire-resistive designs whose fire-resistance ratings were established at densities of less than 15 lb/cu. ft. (240 kg/cu. m).
   3. Bond Strength: 200 lbf/sq. ft. (9.6 kPa) per ASTM E 736 under the following conditions:
      a. Field test sprayed fire-resistive material that is applied to flanges of wide-flange structural-steel members on surfaces matching those that will exist for remainder of steel receiving fire-resistive material.
      b. If surfaces of structural steel receiving sprayed fire-resistive material are primed or otherwise painted, perform series of bond tests specified in UL's "Fire Resistance Directory" for coating materials.
      c. Minimum thickness of sprayed fire-resistive material tested in laboratory shall be 0.75 inch (19 mm).
   4. Compressive Strength: 5.21 lbf/sq. in. (35.9 kPa) as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch (19 mm) and minimum dry density shall be as specified, but not less than 15 lb/cu. ft. (240 kg/cu. m).
   5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
   6. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.
   7. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.
   8. Air Erosion: Maximum weight loss of 0.005 g/sq. ft. (0.05 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.

D. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Flame Spread: 10 or less.
   2. Smoke Developed: 0.
   3. Fungal Resistance: No observed growth on specimens per ASTM G 21.

E. Products: Subject to compliance with requirements, provide products by one of the following:
   1. Cementitious Sprayed Fire-Resistive Material:
      a. Pyrolite 15; Carboline Co., Fireproofing Products Div.
      b. Monokote Type MK-6-HY; W.R. Grace & Co.--Conn., Construction Products Div.
      c. Cafco 300; Isolatek International Corp., Cafco Products.

2.2 EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.

B. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of gypsum or portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:
   1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination," but with an average density of not less than 22 lb/cu. ft. (352 kg/cu. m).
   2. Compressive Strength: 51 lbf/sq. in. (351 kPa) per ASTM E 761.
   3. Bond Strength: 1000 lbf/sq. ft. (48 kPa) per ASTM E 736.
   4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
   5. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.
   6. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.
   7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. (0.27 g/sq. m) per ASTM E 859.
   8. Combustion Characteristics: Passes ASTM E 136.

C. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Flame Spread: 10 or less.
   2. Smoke Developed: 0.
   3. Fungal Resistance: No observed growth on specimens per ASTM G 21.
   4. For exterior applications of sprayed fire-resistive material, provide manufacturer's formulation approved for surfaces exposed to the exterior.

D. Color and Gloss: As indicated by manufacturer's color and gloss designations.

E. Products: Subject to compliance with requirements, provide one of the following:
1. Cement-Aggregate Cementitious Sprayed Fire-Resistive Material:
a. Pyrocrete 240; Carboline Co., Fireproofing Products Div.
b. Monokote Type Z106; W.R. Grace & Co.--Conn., Construction Products Div.
c. Cafco 400; Isolatek International Corp., Cafco Products.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistive designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:
1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of sprayed fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, to determine whether they are in satisfactory condition to receive sprayed fire-resistive material. A substrate is in satisfactory condition if it complies with the following:
1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fire-resistive material with substrate under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of oil, rolling compounds, and other substances capable of interfering with bond.

C. Do not proceed with installation of fire-resistive material until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. Prime substrates where recommended in writing by fire-resistive material manufacturer, unless compatible shop primer has been applied and is in satisfactory condition to receive fire-resistive material.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Apply sprayed fire-resistive material that is identical to products tested as specified in Part 1 in "Product Test Reports" in "Submittals" Article, with respect to rate of application, accelerator use, sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.

C. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.

D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by manufacturer.

3.4 INSTALLING CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. Apply concealed fire-resistive material in thicknesses and densities required to achieve fire-resistance ratings designated for each condition, and comply with requirements for thickness specified in Part 2 "Concealed Sprayed Fire-Resistive Materials" Article.

B. Apply water overspray to concealed, sprayed-fiber fire-resistive material as required to obtain designated fire-resistance rating and where indicated.

3.5 INSTALLING EXPOSED SPRAYED FIRE-RESISTIVE MATERIALS

A. Apply exposed sprayed fire-resistive material in thicknesses and densities required to achieve fire-resistance ratings designated for each condition, unless greater thicknesses and densities are indicated.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.
   1. Extent: For each 1000-sq. ft. (93-sq. m) area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.
      a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. (0.093-sq. m) sample area, with sample width of not less than 6 inches (152 mm) per ASTM E 605.
      b. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.
      c. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."
      d. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.
   2. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.

D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. T-Rating: The amount of time a through-penetration firestop limits the temperature rise on the cold side (outside the test furnace) as tested to ASTM E814 / UL 1479.

H. L-Rating: The L-Rating criteria determines the amount of air leakage, in cubic feet per minute, per square foot of opening (CFM/sq. ft). through the firestop system at ambient and/or 400 degrees F. air temperature at an air pressure differential of 0.30in. W.C. L-Ratings are used to determine the suitability of a firestop to stop smoke and toxic gases in accordance with NFPA Life Safety Code, 101.

1.4 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
   1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
   2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
   3. Fire-resistance-rated floor assemblies.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratjngs, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   1. Penetrations located outside wall cavities.
   2. Penetrations located outside fire-resistive shaft enclosures.
   3. Penetrations located in construction containing fire-protection-rated openings.
   4. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
   2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
   4. For firestop systems exposed to view, provide acrylic based product for compatibility with finish painting.

E. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.5 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated. Literature shall indicate product characteristics, typical uses, performance and limitation criteria, and test data.

B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include UL Tested System designation that evidences compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
   2. Engineering Judgments: Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

C. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.
      a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
      b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
         1) UL in "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

E. Special Inspections: Allow for 1 of each type of firestopping system to be removed and inspected for conformance with approved submittals. All firestopping shall be inspected prior to the installation of ceilings.

F. Above Ceiling review: Prior to the installation of ceilings, a review of construction completion shall be done for firestopping and other items that will not be visible when the ceilings have been installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Architect at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Architect and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Firestop Systems Inc.
   2. Hilti Construction Chemicals, Inc.
   3. International Protective Coatings Corp.
   4. Isolatek International.
   5. 3M Fire Protection Products.
   6. Nelson Firestop Products.
   7. RectorSeal Corporation (The).
   8. Specified Technologies Inc.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-/rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials as required by UL approved Through-Penetration Firestop System. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Elastomeric Spray: Single component, water-based elastomeric compound.

E. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

F. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

G. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

H. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

I. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

J. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

K. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

L. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Provide through-penetration firestop systems for conditions specified whether or not firestopping is indicated.
   1. Through-Penetrations: Install through-penetration firestop systems in all open pentrations and in the annular space in all penetrations in fire-rated barriers.
   2. Membrane-Penetrations: Install through-penetration firestop systems in rated walls. Where required by code, provide products that meet the requirements of third party time/temperature testing.
   3. Construction Joints/Gaps: Provide through-penetration firestop systems for the following locations:

a. Between the edges of floor slabs and exterior walls.
b. Between the tops of walls and the underside of floors or roofs.
c. In the control joints in masonry walls and floors.

4. Smoke Stopping: Provide smoke stops for through-penetrations, membrane penetrations, and construction gaps with a material approved and tested for such applications.

C. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

D. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Prior to installation of ceilings, inspect penetrations requiring firestopping to verify complete installation of firestopping materials. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Reinstall firestopping materials that have been removed for inspection.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

END OF SECTION 07841

B. Samples for Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:
1. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Mildew Resistant Silicone Sealant: Where joint sealants of this type are indicated provide products complying with the following:
   1. Products: Provide one of the following:
      a. 786; Dow Corning
      b. Sanitary 1700; GE Silicones.
      c. 898 Silicone Sanitary Sealant; Pecora Corporation.
      d. PSI-611; Polymeric Systems, Inc.
      e. Tremsil 600 White; Tremco.
   2. Type and Grade: S (single component), and NS (nonsag).
   3. Class 25
   4. Applications:
      a. Use for sealing interior joints with non-porous substrates in wet areas with ceramic tile or epoxy paint around sinks, and between equipment or counters and non-porous walls.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated.

B. Latex Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
   1. Products: Provide one of the following.
      a. Chem-Calk 600; Bostik Inc.
      b. NuFlex 330; NUCO Industries, Inc.
      c. LC 160 All Purpose Acrylic Caulk; Ohio Sealants, Inc.
      d. AC-20; Pecora Corporation.
      e. PSI-701; Polymeric Systems, Inc.
      f. Sonolac; Sonneborn Building Products Div., ChemRex, Inc.
      g. Tremflex 834; Tremco.
   2. Applications: Interior joints in field painted vertical and overhead joints.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Type C: Closed-cell material with a surface skin.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and

approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.

4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, accessories, joints, and connections.
7. Coordination of glazing frames and stops with glass and glazing requirements.

C. Door and Window Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

1.5 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.

B. 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-protection ratings indicated, based on testing according to NFPA 252.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Doors and Frames:
   a. Ceco Door Products; a United Dominion Company.
   b. Curries Company.
   c. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

B. Metallic-Coated Steel Sheets: ASTM A 653/A 653M, Commercial Steel (CS), Type B, with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating; stretcher-leveled standard of flatness.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

2.3 DOORS

A. General: Provide doors of sizes, thicknesses, and designs indicated.

B. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI 250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 2 (18 gage) and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

C. Vision Lite Systems: Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2.4 FRAMES

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Frames of 0.053-inch- (1.3-mm-) (16 gage) thick steel sheet.

C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.

D. Plaster Guards: Provide 0.016-inch- (0.4-mm-) thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

E. Supports and Anchors: Fabricated from not less than 0.042-inch- (1.0-mm-) thick, electrolytic zinc-coated or metallic-coated steel sheet.

F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.5 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and

assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

B. Interior Door Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from the following material:
   1. Cold-rolled steel sheet, unless otherwise indicated.

C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

E. Clearances for Fire-Rated Doors: As required by NFPA 80.

F. Single-Acting, Door-Edge Profile: Beveled edge.

G. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

H. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

I. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

J. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
   1. For concealed overhead door closers, provide space, cutouts, reinforcement, and provisions for fastening in top rail of doors or head of frames, as applicable.

K. Frame Construction: Fabricate frames to shape shown.
   1. Fabricate frames with mitered or coped and continuously welded corners and seamless face joints.
   2. Provide welded frames with temporary spreader bars.

L. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

M. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

N. Glazing Stops: Manufacturer's standard, formed from 0.032-inch- (0.8-mm-) thick steel sheet.
   1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
   2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

O. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
3. Install fire-rated frames according to NFPA 80.
4. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

O. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.6 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions in SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
1. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.
2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.
3. Install fire-rated frames according to NFPA 80.
4. For openings 90 inches (2286 mm) or more in height, install an additional anchor at hinge and strike jambs.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
1. Fire-Rated Doors: Install within clearances specified in NFPA 80.
2. Smoke-Control Doors: Install to comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

SECTION 08380

TRAFFIC DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Double acting, self closing, fully insulated, 1-13/16 inch (46 mm) thick, impact traffic door

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for door frames.

1.2 SUBMITTALS

A. Product Data: For each type of door indicated, include material description, core description, construction details, and finishes. Include installation instructions.

B. Shop Drawings: Show fabrication details and anchorage. Include door elevations, head, jamb and meeting stile details including primeter air seals.

C. Samples for Selection: Full range of manufacturer's standard color selections for facing material.

D. Warranty: Copy of manufacturer's warranty for closeout.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five years experience in producing doors of the type specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors in upright position, wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors.
   1. Note specific doors shipped in other than upright position on bill of lading and contact manufacturer.

B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store in upright position and follow manufacturer's instructions printed on carton.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. RubbAir Door–Division of Eckel Industries, Inc.;100 Groton Shirley Rd.; Ayer, MA 01432-1050. Telephone: (800) 966-7822, (978) 772-0480. Fax: (978) 772-7114.

B. Product: Model Poly-Kor.

2.2 DOOR COMPONENTS

A. Internal Frame:
   1. Perimeter: 1-1/4 x 1-1/2 inch (32x38 mm) rubber honeycomb extrusions.
   2. Stile: Kiln-dried hardwood, full height of mount asembly.

B. Core: 1-1/2 inch (38 mm) thick flexible re-bonded polyurethane foam.

C. Facings: 1/8 inch (3 mm) thick ABS plastic, 5,400 psi (37 MPa) tensile strength, color as selected by architect.

D. Hardware:
   1. Cam: "V" cam design; 1-1/2 inch (38 mm) rise, cast Meehanite, minimum 45,000 psi (310 MPa) compressive strength, ASTM B 633 zinc plated.
      a. Swing: 90x90 degree swing.
   2. Cam Follower: 1-1/8 inch (28 mm) diameter by 5/8 inch (16 mm) wide stud mounted needle bearing roller mounted to cast iron arm; 2,100 lbf (290 kgm) bearing dynamic capacity.
   3. Bottom Bearing: Combination bottom bearing and jamb guard, cast Meehanite, minimum 45,000 psi (310 MPa) compressive strength, ASTM B 633 zinc plated.
   4. Hinge Shaft: 1-5/16 inch (33 mm) diameter full height steel tube, 62,000 psi (430 MPa) tensile strength.
   5. Mount Plate: Full height of door panel by 4-1/2 inch (115 mm) wide, 12 gauge anodized aluminum.

E. Safety Nosing: Full height, 2-ply, reinforced rotocured rubber, 2,200 psi (15 MPa) tensile strength with 1/16 inch (2 mm) vinyl loop seal (loop seal on one leaf at pairs of doors).

F. Seals: Less than 5 cfm (.002 m^3/s) air infiltration per linear foot of seal per ASTM E 283.
   1. Jamb and Header: Polymer impregnated woven nylon fabric in hollow-loop configuration. Jamb seal: Factory installed; fixed. Header seal: Field installed; adjustable.
   2. Sill: 1/16 inch (2 mm) thick neoprene rubber, factory installed; fixed.
   3. Hardware Cutouts: 1/16 inch (2 mm) thick neoprene rubber, factory installed; fixed.

G. Vision Panel: 1/8 inch (3 mm) thick polycarbonate, double glazed in rubber subframe mechanically attached; panels flush with both door faces. Provide standard size.

H. Hold Open Pin: 1/4 inch (6 mm) diameter steel pin with wire ring and 8 inch (205 mm) chain for attachment to jamb.

I. Cam Shields: ABS plastic, color to match door facing, field installed.

2.3 ACCESSORIES

A. Impact Panels: 48 inch (1.22 m) high, 1/8 inch (3 mm) thick vinyl, pad type, color as selected by Architect.

2.4 FABRICATION

A. Shop Assembly: Fabricate door components into 1-13/16 inch (46 mm) thick unitized assembly with facings adhesive bonded to core and frame. Adhesive peel strength shall be 60 piw minimum, standard 2 inches per minute at 25 degrees C., Scott tester. Rigidly connect mount plate, stile and hinge shaft and secure hardware assembly to door with through-rivets at tubing and aluminum or stainless steel screws to stile. Align cam hardware and prepin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Install door with necessary anchors, hardware and accessories.

3.2 ADJUSTING AND CLEANING

A. Follow manufacturer's instructions as required to:
1. Clean and lubricate operating parts.
2. Adjust to open and close smoothly and freely without binding.
3. Check seals for proper fit.

B. Clean surfaces soiled by work as recommended by manufacturer.

C. Remove surplus materials and debris from the site.

END OF SECTION 08380

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior entrance systems.
   2. Interior storefront systems.

B. Related sections include the following:
   1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
   2. Division 8 Section "Glazing."

1.3 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
   1. Framing members transferring stresses, including those caused by structural movement, to glazing units.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Seismic Loads: Provide entrance and storefront systems, including anchorage, capable of withstanding the effects of earthquake motions calculated according to requirements of authorities having jurisdiction or ASCE 7, "Minimum Design Loads for Buildings and Other Structures," Section 9, "Earthquake Loads," whichever are more stringent.

D. Dead Loads: Provide entrance- and storefront-system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
   1. Provide a minimum 1/8-inch (3.18-mm) clearance between members and top of glazing or other fixed part immediately below.
   2. Provide a minimum 1/16-inch (1.59-mm) clearance between members and operable windows and doors.

E. Live Loads: Provide entrance and storefront systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.

F. Structural-Support Movement: Provide entrance and storefront systems that accommodate structural movements including, but not limited to, sway and deflection.

G. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: For entrance and storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

C. Samples for Verification: Of each type of exposed finish required in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

B. Source Limitations: Obtain each type of entrance and storefront system through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated. Other manufacturers' systems with equal performance characteristics may be considered. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding Standards: Comply with applicable provisions of AWS D1.2, "Structural Welding Code--Aluminum."

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination." Review methods and procedures related to aluminum storefront system.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including, but not limited to, excessive deflection.
   2. Adhesive sealant failures.
   3. Cohesive sealant failures.
   4. Failure of system to meet performance requirements.
   5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   6. Failure of operating components to function normally.

C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Butler Manufacturing Company; Vistawall Architectural Products.
   2. EFCO Corporation.
   3. International Aluminum Corporation; U.S. Aluminum.
   4. Kawneer Company, Inc.

B. Products:
   1. Interior Entrances and Storefronts:
      a. Kawneer: Trifab 400
      b. U.S. Aluminum: Series 400
      c. Vistawall: Series 1000
   2. Doors:
      a. Kawneer: 500 Entrance

b. U.S. Aluminum: Series 550 Entrance
c. Vistawall: 500 Entrance

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Glazing as specified in Division 8 Section "Glazing."

D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

2.3 COMPONENTS

A. Framing: 1-3/4 by 4 inch, center glazed profile.

B. Interior Doors: Provide manufacturer's standard 1-3/4-inch- (44.5-mm-) thick glazed doors with minimum 0.125-inch- (3-mm-) thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.
1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
2. Stile Design: Wide stile; over 4 inches (101.6 mm) wide with 10 inch high bottom rail.

C. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements from stainless steel.. Provide nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Reinforce members as required to retain fastener threads.
   2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

2.4 HARDWARE

A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

B. Ball-Bearing Butts: ANSI/BHMA A156.1, Grade 1, 5-knuckle, 4-1/2-by-4-inch (101.6-by-114.3-mm) ball-bearing butts. Provide nonremovable pins at hinges exposed to door outside and provide nonferrous hinges for applications exposed to weather. Provide 3 hinges at each leaf for doors up to 36 inches (914 mm) wide and 80 inches (2032 mm) tall; provide 4 hinges at each leaf for taller doors.

C. Pull Handles: Aluminum pull handles as indicated on Drawings.

D. Push Bars: Aluminum push bars as indicated on Drawings.

E. Cylinders: As specified in Division 8 Section "Door Hardware."

F. Additional Hardware: As specified in Division 8 Section "Door Hardware."

2.5 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
   1. Fabricate components for manufacturer's recommended frame construction and assembly.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.

C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Welding: Weld components to comply with referenced AWS standard. Weld before finishing components to greatest extent possible. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

F. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

G. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
   1. Interior Doors: Provide ANSI/BHMA A156.16 silencers at stops to prevent metal to metal contact. Provide 3 silencers on strike jamb of single-door frames and 2 silencers on head of double-door frames.

2.6 ALUMINUM FINISHES

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

B. 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.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

2.7 STEEL PRIMING

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.

B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.

C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

D. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
   1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

E. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

F. Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

G. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:
   1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
   2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm). Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).
   3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
   1) 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.

4. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in the Project construction schedule. Submit the final Door Hardware Schedule after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

C. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
   1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Electrified Door Hardware Supplier Qualifications: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
   a. Engineering Responsibility: Prepare 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.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute 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 Qualifications: Experienced in providing consulting services for electrified door hardware installations.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.

E. Regulatory Requirements: Comply with provisions of the following:
   1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
      a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
      b. Door Closers: Comply with the following maximum opening-force requirements indicated:
         1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
         2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
      c. Thresholds: Not more than 1/2 inch (13 mm) high. Bevel raised thresholds with a slope of not more than 1:2.
   2. NFPA 101: Comply with the following for means of egress doors:
      a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
      b. Door Closers: Not 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. Thresholds: Not more than 1/2 inch (13 mm) high.
   3. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

F. Fire-Rated Door Assemblies: Provide door hardware for 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.

G. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section " Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

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 Schedule, and include basic installation instructions with each item or package.

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved 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.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of operators and door hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for 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.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
   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 the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
   2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

2.2 HINGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hinges:
      a. Hager Companies (HAG).
      b. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
      c. PBB, Inc. (PBB).

d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2. Continuous Geared Hinges:
   a. Hager Companies (HAG).
   b. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
   c. Pemko Manufacturing Co., Inc. (PEM).
   d. Zero International, Inc. (ZRO).

B. 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).

C. The following is a guide for hinge size and type required for this project.

	Manufacturer	Interior:
1-3/4" Doors up to 3'-0" wide	Stanley	FBB179-4 1/2"
	Hager	BB1279-4 1/2"
	McKinney	TA-TB2714-4 1/2"
	PPB	BB21
1-3/4" Doors over 3'-0" wide	Stanley	FBB168-4 1/2"
	Hager	BB1168-4 1/2"
	McKinney	T4A-T4B3786-4 1/2"
	PPB	4B21

D. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

E. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
   1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
      a. Outswinging corridor doors with locks.
   2. Corners: Square.

F. Fasteners: Comply with the following:
   1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
   2. Wood Screws: For wood doors and frames.
   3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
   4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 MORTISED LOCKS AND LATCHES

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

1. Mechanical Locks and Latches:
   a. Schlage Lock Company; an Ingersoll-Rand Company (SCH).

B. Mortise Locks: Stamped steel case with steel or brass parts; BHMA Grade 1; Series 1000.
1. Provide the following manufacturers and designs:
   a. Schlage L9000 Series

C. Auxiliary Locks: BHMA Grade 1.
1. Provide the following manufacturers and designs:
   a. Schlage L9000 Series

D. Lock Trim: Comply with the following:
1. Lever: Cast.
2. Escutcheon (Rose): Forged.
3. Dummy Trim: Match lever lock trim and escutcheons.
4. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:
   a. Schlage, 03 design

E. Mortise Lock Functions: Lock functions as indicated in the hardware schedule shall be as follows:

FUNCTION	SCHLAGE
A	80
B	50
C	10
D	70
E	60
F	40

F. Auxiliary Lock Functions: Lock functions as indicated in the hardware schedule shall be as follows:

FUNCTION	SCHLAGE
I	L480

G. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
2. Deadbolts: Minimum 1-inch (25-mm) bolt throw.

H. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

2.4 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flush Bolts:
   a. Burns Manufacturing Incorporated (BM).

b. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
c. Hager Companies (HAG).
d. Ives: H. B. Ives (IVS).
e. Rockwood Manufacturing Company (RM).

B. Standards: Comply with the following:
1. Automatic and Self-Latching Flush Bolts: BHMA A156.3.
2. Manual Flush Bolts: BHMA A156.16.

C. Flush Bolts: BHMA Grade 1, designed for mortising into door edge.

D. Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
1. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.

2.5 EXIT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Von Duprin; an Ingersoll-Rand Company (VD).

B. Products: All exit devices for this project shall be one of the following:
1. 98 Series by Von Duprin Division.

C. Standard: BHMA A156.3.
1. BHMA Grade: Grade 1.

D. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."

E. 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.

F. Fire Exit 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.

G. Through Bolts: For exit devices and trim on fire-rated wood doors.

2.6 CYLINDERS AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cylinders: Same manufacturer as for locks and latches.

B. Standards: Comply with the following:
1. Cylinders: BHMA A156.5.
2. Key Control System: BHMA A156.5.

C. Cylinder Grade: BHMA Grade 1.

D. 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: Six.
   2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
   3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

E. 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, and usable with other manufacturers' cylinders.

F. Keying System: By Owner. Cores will be replaced by the Owner.

G. Keys: Provide nickel-silver keys complying with the following:
   1. Quantity: In addition to one extra blank key for each lock, provide the following:
      a. Cylinder Change Keys: Three.
      b. Master Keys: Three.

2.7 STRIKES

A. Standards: Comply with the following:
   1. Strikes for Mortise Locks and Latches: BHMA A156.13.
   2. Strikes for Auxiliary Deadlocks: BHMA A156.5.
   3. Dustproof Strikes: BHMA A156.16.

B. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

C. Dustproof Strikes: BHMA Grade 1.

2.8 OPERATING TRIM

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. Baldwin Hardware Corporation (BH).
   2. Burns Manufacturing Incorporated (BM).
   3. Ives: H. B. Ives (IVS).
   4. Rockwood Manufacturing Company (RM).
   5. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate from stainless steel, unless otherwise indicated.

D. Pull Design:
1. 1" diameter solid stainless steel round bar, 10" center to center, with a projection of 2-1/2", and a clearance of 1-1/2".
2. Provide through bolts, one at each base, for fastening.

E. Push Plate Design: +0.050" thick solid stainless steel plate, 4" x 16".

F. Full Height Pull Design:
1. 1-1/4 inch diameter stainless steel tube, with a projection of 2-1/2", and a clearance of 1-1/2".
2. Provide through bolts, one at each base, for fastening.
3. Center the pull on the stile of the door.
4. Available Product: Model T3004-01-024-P2025 by Elmes or approved substitute.

G. Push Bar Design:
1. 1" diameter solid stainless steel round bar with a projection of 2-1/2" and a 1-1/2" clearance.
2. Bases for each push bar shall span the door width and be centered on each door stile.
3. Where used on flush doors, the center to center dimensions shall be equal to the door width minus the standard lock backset for each stile.

2.9 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Surface-Mounted Closers:
   a. LCN Closers; an Ingersoll-Rand Company (LCN).
2. Closer Holder Release Devices:
   a. LCN Closers; an Ingersoll-Rand Company (LCN).

B. Standards: Comply with the following:
1. Closers: BHMA A156.4.
2. Closer Holder Release Devices: BHMA A156.15.

C. Surface Closers: BHMA Grade 1.

D. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."

E. Size of Units: Unless otherwise indicated, provide the following. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. LCN:
   a. Interior: 1460 Series

2.10 PROTECTIVE TRIM UNITS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Metal Protective Trim Units:
      a. Burns Manufacturing Incorporated (BM).
      b. Hager Companies (HAG).
      c. Ives: H. B. Ives (IVS).
      d. Rockwood Manufacturing Company (RM).

B. Standard: Comply with BHMA A156.6.

C. Materials: Fabricate protection plates from the following:
   1. Stainless Steel: 0.050 inch (1.3 mm) thick; beveled top and 2 sides.

D. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.

E. Fabricate protection plates (push, kick, or armor) as follows:
   1. Kick Plates shall be .050 gauge, solid stainless steel, 8" high by 1-1/2" less than door width for single doors and 1" less than door width for pairs of doors. Kick plates shall be applied to push side of all doors where noted.
   2. Armor Plates shall be .050 gauge, solid stainless steel, 40" high by 1-1/2" less than door width for single doors and 1" less than door width for pairs of doors.

2.11 STOPS AND HOLDERS

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. Burns Manufacturing Incorporated (BM).
   2. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
   3. Hager Companies (HAG).
   4. Ives: H. B. Ives (IVS).
   5. Rockwood Manufacturing Company (RM).

B. Standards: Comply with the following:
   1. Stops and Bumpers: BHMA A156.16.
   2. Electromagnetic Door Holders: BHMA A156.15.
   3. Combination Overhead Holders and Stops: BHMA A156.8.
   4. Door Silencers: BHMA A156.16.

C. Stops and Bumpers: BHMA Grade 1. Wall type bumpers with concealed type flange shall be used where ever possible and shall be one of the following:
   1. Ives - 407 1/2
   2. Door Controls - 3211T
   3. Rockwood - 409

D. Floor Stops: Where wall type bumpers cannot be used, provide dome type, floor mounted stops of the proper height as follows:

1. Ives - 436, 438
2. Door Controls - 3310X, 3320X
3. Rockwood - 440, 442
4. Do not mount floor stops where they will impede traffic.

E. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

F. Silencers for Wood Door Frames: BHMA Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch (16 by 19 mm); fabricated for drilled-in application to frame.

G. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.12 COAT HOOKS

A. Provide coat hooks as manufactured by Doug Mockett & Co., Model CH2, Metallic Silver (23). Install on interior face of doors.

2.13 FABRICATION

A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
1. Manufacturer's identification will be 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 for finishes. 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. 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. Mortise hinges to doors.
   b. Strike plates to frames.

c. Closers to doors and frames.

3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
   a. Surface hinges to doors.
   b. Closers to doors and frames.
   c. Surface-mounted exit devices.
4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.14 FINISHES

A. Standard: Comply with BHMA A156.18.

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.

D. Provide the following finshes:

1.	Butts and Hinges:	26D
2.	Locks & Lock Trim:	26D
3.	Exit Devices:	32D
4.	Door Controls - Closers:	Sprayed Alum. Finish
5.	Mortise Locks & Latches:	26D
6.	Door Stops	26D/32D
7.	Weatherstripping	Aluminum
8.	Threshold	Aluminum
9.	Kickplates	32D
10.	Pulls	32D

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 SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
   3. 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 9 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.

3.4 FIELD QUALITY CONTROL

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

3.5 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. Door Closers: 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. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
   2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.6 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 door hardware is without damage or deterioration at time of Substantial Completion.

3.7 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.

3.8 DOOR HARDWARE SCHEDULE

HWS1

Doors: B07, 508, 512, 608, 608a, 708, 710

Each door to receive: Hinges, Lockset (storage function) (Door B07 to be interlocked with elevator operation for safety), Closer, Stop as required.

HWS2

Doors: 126, 130, 132, 136, 319, 615, 618

Each door to receive: Hinges, Lockset (office function), Stop; Coat Hook at Doors 130, 615 and 618..

HWS3

Doors: 503, 504, 603, 604, 703, 704

Each door to receive: Hinges, Push Plate, Pull, Closer, Kickplate, Stop.

HWS4

Doors: 508a, 513, 516, 626a, 626b.

Each door to receive: Hinges, Lockset (storage function), Stop as required.

HWS5

Doors: 511, 520, 612, 714

Each door to receive: Hinges, Latchset (passage function), Stop; Coat Hook at Doors 520, 612 and 714.

HWS6

Doors: 518a, 706

Each leaf to receive: Hinges, Push Plate, Pull, Closer. Owner to provide and install devices for access control.

HWS7

Doors: 518b, 519, 521, 614, 619b, 620b, 621b, 623

Each door to receive: Hinges, Latchset (door to be prepped for installation of access hardware by Owner), Closer, Door Stop as required.

HWS8

Doors: 613, 619a, 621a, 716

Each leaf to receive: Hinges. Active leaf to receive: Lockset (storage function), Closer. Inactive leaf to receive: Flush bolts.

HWS9

Doors: 620a

Each leaf to receive: Hinges. Active leaf to receive: Exit Device (access hardware to be provided by Owner), Closer, Stop. Inactive leaf to receive: Flush bolts.

HWS10

Doors: 712a, 712b

Each door to receive: Hinges, Lockset (office function), Closer, Stop.

HWS11

Doors: 713, 717e, 725

Each door to receive: Hinges, Exit Device, Closer, Stop.

HWS12

Doors: 717a, 717b, 717c, 717d, 726
Each leaf to receive: Hinges, Exit Device (concealed rod), Closer.

END OF SECTION 08711

SECTION 08800

GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Glazed entrances.
   4. Interior borrowed lites.
   5. Storefront glazing.
   6. Silvered mirrored glass.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses as indicated in the glazing schedules.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glazing Schedule: Use same designations indicated in this section for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

C. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201 and ANSI Z97.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following products:
1. Float and Heat Treated Glass:
   a. Ford Motor Co., Glass Div.
   b. Globe Amerada Glass Co.
   c. Guardian Industries Corp.
   d. Interpane Glass Company
   e. Pilkington Sales (North America) Limited.
   f. Southwall Technologies
   g. Tempglass.
   h. Viracon, Inc.
2. Wire Glass:
   a. Ashai Glass Co./Ama Glass Corp.
   b. Central Glass Co., Ltd.

c. Nippon Sheet Glass Co., Ltd.
d. Pilkington Glass Ltd.

2.2 HEAT-TREATED FLOAT GLASS

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.

B. Clear Tempered Float Glass GL-1: ASTM C 1048; Type I (transparent glass, flat); Quality q3 (glazing select); Class 1 (clear), Kind FT (fully tempered), 1/4 inch (6 mm) thick.

2.3 MIRRORED GLASS

A. Silvered Mirrored Glass: Tempered float glass with successive layers of chemically deposited silver, electrically or chemically deposited copper, and manufacturer's standard organic protective coating applied to second glass surface to produce a coating system complying with FS DD-M-411.

B. Mirrored Glass Edge Treatment: Rounded polished edge.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tape: Closed-cell, PVC foam tape; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
1. Type 1, for glazing applications in which tape acts as the primary sealant.

2.5 GLAZING GASKETS

A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
1. Neoprene.
2. EPDM.
3. Silicone.

4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed.
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:
a. Gunther Mirror Mastics.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Minimum required face or edge clearances.
3. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 MIRRORS

A. Mastic Spot Installation System: Install mirrored glass units with mastic as follows:
   1. Apply barrier coat to mirrored glass backing where approved in writing by manufacturers of mirrored glass and backing material.
   2. Apply mastic in spots to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrored glass units and face of mounting surface.
   3. After mastic is applied, align mirrored glass units and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrored glass and mounting surface.

3.7 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior gypsum wallboard.
   2. Non-load-bearing steel framing.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood blocking.

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 SUBMITTALS

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

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples: For the following products:
   1. Trim Accessories: Full-size sample in 12-inch- (300-mm-) long length for each aluminum trim accessory indicated.

1.5 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."

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. STC-Rated Assemblies: Consider all walls to be STC-rated assemblies.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

1.7 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. 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. Steel Framing and Furring:
   a. Dietrich Industries, Inc.
   b. MarinoWare; Division of Ware Ind.
   c. National Gypsum Company.
   d. Unimast, Inc.
2. Gypsum Board and Related Products:
   a. G-P Gypsum Corp.
   b. National Gypsum Company.
   c. 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. Hanger Attachments to Concrete: As follows:
   1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.

D. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   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. 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: 0.0312 inch (0.79 mm).
   2. Depth: As indicated on the plans.

C. 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. Type X:
      a. Thickness: 5/8 inch (15.9 mm).
      b. Long Edges: Tapered.
      c. Location: Vertical surfaces, unless otherwise indicated.
   2. Type MR:
      a. Thickness: 5/8 inch (15.9 mm).
      b. Long Edges: Tapered.
      c. Location: Vertical surfaces, unless otherwise indicated.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc; plastic where abutting exterior aluminum window system.
2. Shapes:
a. Cornerbead: Use at outside corners, unless otherwise indicated.
b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges or where abutting different materials.
c. Expansion (Control) Joint:
1) Metal zinc control joint: .093 by USG or Gold Bond. Use where indicated on the drawings
2) Plastic E-Z Strip control joint by Gold Bond, use where not indicated on the drawings. Install over door jambs or in walls at a minimum of 30 feet on center.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
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:
a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
4. Products: Provide the following products by Gordon or approved substitute:
a. 1/2 inch Reveal: 312-5/8
b. 2 inch Reveals: 320-5/8 and 520-5/8
5. Provide tapered edge style to receive drywall compound whether indicated on the details or not.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.

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 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 or drying-type, all-purpose 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 or drying-type, all-purpose 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.

2.7 ACOUSTICAL SEALANT

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, 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.

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.

2.8 AUXILIARY MATERIALS

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

B. 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.

C. Isolation Strip at Exterior Walls:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
   1. Available Products:
      a. CertainTeed Corporation.
      b. Johns Manville Corporation.
      c. Owens Corning.

E. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

F. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

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. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Unless noted elsewhere, 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. 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 support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to steel deck tabs.
6. 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. Sway-brace suspended steel framing with hangers used for support.

D. Wire-tie furring channels to supports.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

F. 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.
1. Where studs are installed directly against exterior walls, install foam-gasket isolation strip between studs and wall.

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 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.
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.
a. Terminate partition framing at suspended ceilings where indicated.

D. Install steel studs and furring at the following spacings:
   1. Single-Layer Construction: 24 inches (609 mm) o.c., unless otherwise indicated.
   2. Multilayer Construction: 24 inches (609 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. Curved Partitions:
   1. Cut top and bottom track (runners) through leg and web at 2-inch (50-mm) intervals for arc length. In cutting lengths of track, allow for uncut straight lengths of not less than 12 inches (300 mm) at ends of arcs.
   2. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   3. Support outside (cut) leg of track by clinching steel sheet strip, 1-inch- (25-mm-) high-by-thickness of track metal, to inside of cut legs using metal lock fasteners.
   4. Begin and end each arc with a stud, and space intermediate studs equally along arcs at stud spacing recommended in writing by gypsum board manufacturer for radii indicated. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.

G. 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 0.312 inch (0.79 mm) (20 gage) studs at each jamb, unless otherwise indicated.
   2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint.
   3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. 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 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.

C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 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 open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, 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 LC-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.

3.8 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. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Curved Partitions:
1. Install panels horizontally and unbroken, to the extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. Wet gypsum panels on surfaces that will become compressed where curve radius prevents using dry panels. Comply with gypsum board manufacturer's written recommendations for curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
3. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches (300 mm) o.c.

4. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.
5. Allow wetted gypsum panels to dry before applying joint treatment.

3.9 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 at locations indicated on Drawings, or if not indicated, install control joints not over 30 feet apart and in specific locations approved by Architect for visual effect.

3.10 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 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, according to ASTM C 840, for locations indicated:
1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, and for fire-resistance-rated and sound-rated assemblies, unless otherwise indicated.
3. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface at curved partitions and soffits.

3.11 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed.. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.

2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
   a. Installation of 80 percent of lighting fixtures, powered for operation.
   b. Installation, insulation, and leak and pressure testing of water piping systems.
   c. Installation of air-duct systems.
   d. Installation of air devices.
   e. Installation of mechanical system control-air tubing.
   f. Installation of ceiling support framing.
   g. Installation of Through Penetration Firestop Systems.

END OF SECTION 09260

SECTION 09265

GYPSUM BOARD SHAFT-WALL 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. Work to existing shaft enclosures.

B. Related Sections include the following:
   1. Division 9 "Gypsum Board Assemblies" for applying and finishing panels in gypsum board shaft-wall assemblies.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

B. Fire-Test-Response Reports: From a qualified independent testing and inspecting agency substantiating each gypsum board shaft-wall assembly's required fire-resistance rating.
   1. Include data substantiating that elevator entrances and other items that penetrate each gypsum board shaft-wall assembly do not negate fire-resistance rating.

C. Research/Evaluation Reports: Evidence of compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction that substantiate required fire-resistance rating for each gypsum board shaft-wall assembly.

1.5 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: 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. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

B. Steel Framing: ASTM C 645.
1. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized coating.

C. Gypsum Liner Panels: Manufacturer's proprietary liner panels in 1-inch (25.4-mm) thickness and with moisture-resistant paper faces.

D. Gypsum Wallboard: ASTM C 36, core type as required by fire-resistance-rated assembly indicated.
1. Edges: Tapered.

E. Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 9 Section "Gypsum Board Assemblies" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

F. Gypsum Wallboard Joint-Treatment Materials: ASTM C 475 and as specified in Division 9 Section "Gypsum Board Assemblies."

G. 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.

H. Track (Runner) Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.
1. Powder-Actuated Fasteners: Provide powder-actuated fasteners with capability to sustain, without failure, a load equal to 10 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 1190.
2. Postinstalled Expansion Anchors: Where indicated, provide expansion anchors with capability to sustain, without failure, a load equal to 5 times that imposed by shaft-wall assemblies, as determined by testing conducted by a qualified independent testing agency according to ASTM E 488.

I. Sound Attenuation Blankets: ASTM C 665 for Type I, unfaced mineral-fiber-blanket insulation produced by combining thermosetting resins with mineral fibers manufactured from slag or rock wool.

2.3 GYPSUM BOARD SHAFT WALL

A. Basis-of-Design Product: As indicated on Drawings by design designation of a qualified testing and inspecting agency.

B. Deflection Limit: L/240.

C. Studs: Manufacturer's standard profile for repetitive members and corner and end members and for fire-resistance-rated assembly indicated.
   1. Depth: As indicated.
   2. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.

D. Track (Runner): Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches (51 mm), in depth matching studs.
   1. Minimum Base Metal Thickness: Manufacturer's standard thicknesses that comply with structural performance requirements for stud depth indicated.

E. Room-Side Finish: Gypsum board.

F. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

G. Cavity Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft-wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 7 Section "Sprayed Fire-Resistive Materials."
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (600 mm) o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:
   1. ASTM C 754 for installing steel framing.
   2. Division 9 Section "Gypsum Board Assemblies" for applying and finishing panels.

B. Do not bridge building expansion joints with shaft-wall assemblies; frame both sides of joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.
   1. At elevator hoistway door frames, provide jamb struts on each side of door frame.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate gypsum finish panels from building structure to prevent cracking of finish panels while maintaining continuity of fire-rated construction.

F. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with manufacturer's written instructions or ASTM C 919, whichever is more stringent.

G. In elevator shafts where gypsum board shaft-wall assemblies cannot be positioned within 2 inches (51 mm) of the shaft face of structural beams, floor edges, and similar projections into shaft, install 1/2- or 5/8-inch- (12.7- or 15.9-mm-) thick, gypsum board cants covering tops of projections.
   1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches (610 mm) o.c. with screws fastened to shaft-wall framing.
   2. Where steel framing is required to support gypsum board cants, install framing at 24 inches (610 mm) o.c. and extend studs from the projection to the shaft-wall framing.

END OF SECTION 09265

SECTION 09310

CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
1. Ceramic mosaic tile.
2. Glazed wall tile.
3. Waterproof membrane for thin-set tile installations.
4. Stone thresholds installed as part of tile installations.

B. Related Sections include the following:
1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Division 14 Section "Electric Traction Elevators" for elevator cabs to receive tile floors.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the values indicated as determined by testing identical products per ASTM C 1028.

1.5 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:
1. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
   1. Each type and composition of tile and for each color and texture required.
   2. Full-size units of each type of trim and accessory for each color required.
   3. Stone thresholds in 6-inch (150-mm) lengths.

D. Grout Samples for Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination."
   1. Review details and components for crack suppression.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in the following paragraphs of Part 2.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories of color and finish indicated.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
   1. Where tile is indicated for installation in swimming pools, on exteriors, or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:
   1. Composition: Porcelain.
   2. Module Size: 2 by 2 inches (50.8 by 50.8 mm) and 12 by 12 inches (305 by 305 mm).
   3. Nominal Thickness: 1/4 inch (6.35 mm).
   4. Face: Plain with cushion edges.
   5. Static Coefficient of Friction: Level Surfaces, minimum 0.6.
   6. Tile Type/Products for 2 by 2: Available products include the following:
      a. Unglazed Ceramic Mosaics, matte finish.
      b. Colors: D318 Medium Coral for floors; D398 Sachet for walls.
      c. Amythest for walls.
   7. Tile Type/Products for 12 by 12: Available products include the following:
      a. Ariostea-Geo Natura 127A Britannia 12"x12" (for the Café).
      b. Daltile CD05 (unpolished) (for the elevator cabs).
      c. Bianco alpi, 12" x 12".

B. Trim Units for Ceramic Tile: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Ceramic Tile Base: Internal coved corner, exterior bullnosed corner.

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
   1. Provide white, honed marble complying with the Marble Institute of America's Group A requirements for soundness.

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
   1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

B. Organic Adhesive: ANSI A136.1, Type I.

1.9 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products in the following paragraphs of Part 2.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories of color and finish indicated.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
   1. Where tile is indicated for installation in swimming pools, on exteriors, or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:
   1. Composition: Porcelain.
   2. Module Size: 2 by 2 inches (50.8 by 50.8 mm) and 12 by 12 inches (305 by 305 mm).
   3. Nominal Thickness: 1/4 inch (6.35 mm).
   4. Face: Plain with cushion edges.
   5. Static Coefficient of Friction: Level Surfaces, minimum 0.6.
   6. Tile Type/Products for 2 by 2: Available products include the following:
      a. Unglazed Ceramic Mosaics, matte finish.
      b. Colors: D318 Medium Coral for floors; D398 Sachet for walls.
      c. Amythest for walls.
   7. Tile Type/Products for 12 by 12: Available products include the following:
      a. Ariostea-Geo Natura 127A Britannia 12"x12" (for the Café).
      b. Daltile CD05 (unpolished) (for the elevator cabs).
      c. Bianco alpi, 12" x 12".

B. Trim Units for Ceramic Tile: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Ceramic Tile Base: Internal coved corner, exterior bullnosed corner.

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch (12.7 mm) above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
   1. Provide white, honed marble complying with the Marble Institute of America's Group A requirements for soundness.

2.5 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
   1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

B. Organic Adhesive: ANSI A136.1, Type I.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Grout tile to comply with the requirements of the following tile installation standards:
1. For ceramic tile grouts (sand-portland cement, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with waterproofing manufacturer's written instructions to produce a waterproof membrane of uniform thickness bonded securely to substrate.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.5 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:
1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. 12" x 12" Tile: ¼ inch.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.6 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
1. Wall Tile: 1/16 inch (1.6 mm).

D. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
   2. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
   3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
   4. Products are identified with appropriate markings of applicable testing and inspecting agency.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated for each designation in the following paragraphs of Part 2.

2.2 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
   1. Mounting Method for Measuring Noise Reduction Coefficient: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface per ASTM E 795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing ASTM E 1264 pattern designations and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Water-Felted, Mineral-Base Acoustical Panels for Acoustical Panel Ceiling: Where this designation is indicated, provide acoustical panels complying with the following:
   1. Products: Provide one of the following:
      a. Armstrong Fine Fissured No. 1732.
      b. Celotex Fine Fissured HHF-154.
      c. USG Radar No. 2120.
   2. Classification: Panels fitting ASTM E 1264 for type and form as follows:
      d. Type III, mineral base with painted finish; Form 2, water felted.
   3. Pattern: Panels fitting ASTM E 1264 pattern designation CE.
   4. Color: White.
   5. Light Reflectance Coefficient: Not less than LR 0.80.
   6. Noise Reduction Coefficient: NRC 0.55.
   7. Ceiling Attenuation Class: Not less than CAC 35.
   8. Edge Detail: Angled tegular or Reveal.
   9. Thickness: 5/8 inch (16 mm).
   10. Size: 24 by 24 inches (610 by 610 mm).

D. Open-Cell Ceiling: MagnaGrid by Interfinish or approved substitute.

1. Grid: Clear anodized aluminum, 24 by 24 inches (610 by 610 mm), 2 inch depth.
2. Panel Layout: 203/30; 8 by 8 inch (200 by 200 mm) open pattern.
3. Moldings: As required for system.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Suspension System for Acoustical Panel Ceilings: Where this designation is indicated, provide acoustical panel ceiling suspension system complying with the following:
1. Products: Provide one of the following:
a. Prelude 15/16" Exposed Tee System; Armstrong World Industries, Inc.
b. ClassicStab System; BPB Celotex.
c. 1200 System; Chicago Metallic Corporation.
d. DX System; USG Interiors, Inc.
2. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G01 (Z001) coating designation, with prefinished 15/16-inch- (24-mm-) wide metal caps on flanges; other characteristics as follows:
a. Structural Classification: Intermediate-duty system.
b. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
c. Face Design: Flush face.
d. Cap Material: Steel sheet.
e. Cap Finish: Painted white.
3. Specialty Trim: Provide specialty trim at edges of ceiling grid system in Rooms 706 and 717: Armstrong Axiom Perimeter Trim, 2" Trim Channel, AX2STR or equal.

C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
1. Postinstalled 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 hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

F. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.

B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings 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 and publications.
5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs acoustical panel ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of acoustical panels until deficiencies have been corrected.

1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
   a. Installation of 80 percent of lighting fixtures, powered for operation.
   b. Installation, insulation, and leak and pressure testing of water piping systems.
   c. Installation of air-duct systems.
   d. Installation of air devices.
   e. Installation of mechanical system control-air tubing.
   f. Installation of through-penetration firestop systems.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Fire-Test-Response Characteristics: Provide products with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Store tiles on flat surfaces.

D. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.7 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

3. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide the products indicated for each designation in the following paragraphs of Part 2.

2.2 RESILIENT TILE

A. Vinyl Composition Tile: Where this designation is indicated, provide vinyl composition floor tile complying with ASTM F 1066 and the following:
   1. Products: As follows:
      a. Armstrong World Industries
      b. Mannington Commercial
      c. Azrock Commercial Flooring
   2. Class: Class 2 (through-pattern tile).
   3. Static Coefficient of Friction: Level Surfaces, minimum 0.6.
   4. Thickness: 1/8 inch (3.2 mm).
   5. Size: 12 by 12 inches (304.8 by 304.8 mm).

2.3 RESILIENT ACCESSORIES

A. Rubber Base: Where this designation is indicated, provide vinyl wall base complying with FS SS-W-40, Type I and the following:
   1. Products: As follows:
      a. Roppe; colors P118 Peacock and P190 Garnet.
      b. Johnsonite; color 129 Silk.
   2. Style: Cove with top-set toe.
   3. Minimum Thickness: 1/8 inch (3.2 mm).
   4. Height: 4 inches (101.6 mm).
   5. Lengths: Cut lengths 48 inches (1219.2 mm) long.
   6. Outside Corners: Job formed.
   7. Inside Corners: Job formed.
   8. Surface: Smooth.

B. Rubber Accessory Molding: Where this designation is indicated, provide rubber accessory molding complying with the following:

1. Available Products: As follows:
   a. Johnsonite.
2. Edge Guard: EG-XX-H; color 59 Heather.
3. Carpet to Tile Adapter: CE-XX A; color 59 Heather.
4. Vinyl Reducer: SSR-XX-B; color 49 Beige.
5. Single Flange Track Base: CDB-00-A

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other manufacturer's requirements. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified.

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 that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by flooring manufacturer.
2. Subfloor finishes comply with 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.

C. Moisture and Surface Alkalinity Testing:

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. General: Comply with tile manufacturer's written installation instructions.

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 that equal less than one-half of a tile at perimeter.
1. Lay tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in the 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.

D. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

G. Install tiles on covers for telephone and electrical ducts, and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on covers. Tightly adhere edges to perimeter of floor around covers and to covers.

H. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to comply with tile manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.
1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Hand roll tiles according to tile manufacturer's written instructions.

3.4 RESILIENT ACCESSORY INSTALLATION

A. General: Install resilient accessories according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
   1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   3. Do not stretch base during installation.
   4. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
   5. Form outside corners on job from straight pieces of maximum lengths possible, without whitening at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
   6. Form inside corners on job, from straight pieces of maximum lengths possible, by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

C. Place resilient accessories so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.5 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:
   1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
   2. Sweep or vacuum floor thoroughly.
   3. Do not wash floor until after time period recommended by flooring manufacturer.
   4. Damp-mop floor to remove marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.

maintenance program.

END OF SECTION 09650

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. New tufted carpet.

B. Related Sections include the following:
   1. Division 9 Section "Resilient Flooring" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Shop Drawings: Show the following:
   1. Carpet type, color, and dye lot.
   2. Seam locations, types, and methods.
   3. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch- (300-mm-) square Sample.

D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

E. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

F. CRI Labels: Provide data or certificates showing the carpet and adhesives meet the requirements of CRI Indoor Air Quality Carpet and Adhesive Testing Programs.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Product Requirements."

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 CARPET A

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following to match existing:
   1. Certificate by J & J Commercial; custom color No. 952-05091-6D.

B. Fiber Content: 100 percent J&J Commercial on SDN

C. Face Construction: Dense loop.

D. Dyed Method: Colorloc Plus

E. Gauge: 1/8

F. Stitches: 8.7 per inch.

G. Thickness: .171 inch.

H. Surface Pile Weight: 28 oz./sq. yd. (g/sq. m).

I. Primary Backing: Polypropylene.

J. Secondary Backing: LifeSpan.

K. Width: 12 feet

L. Performance Characteristics: As follows:
   1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
   2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
   3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
   4. Static Propensity: 3.0 KV or less

M. Seams: Chemically welded.

2.2 CARPET B

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   1. Perception by Patcraft; No. 18443-00301, Point of View.

B. Fiber Content: Premise Bulked, solution dyed – space dyed.

C. Face Construction: Micro-Weave II Patterned Loop.

D. Gauge: 5/64

E. Stitches: 10 per inch (mm).

F. Thickness: .187 inch.

G. Surface Pile Weight: 30 oz./sq. yd. (g/sq. m).

H. Primary Backing: Polypropylene.

I. Secondary Backing: Polypropylene.

J. Width: 12 feet

K. Performance Characteristics: As follows:
   1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
   2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
   3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
   4. Static Propensity: 3.5 KV or less

2.3 CARPET C

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   1. Ch'i, by Invision (J & J); custom color No. 952-05091-4B.

B. Fiber Content: Solutia Ultron VIP nylon 6,6 BCF w/ Permanent Static Protection.

C. Face Construction: Inter-Lok Tufting System

D. Dye Method: Skein

4. Static Propensity: 3.5 KV or less

L. Five percent overstock for end user.

2.4 CARPET D

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following to match existing:
1. Spin, by Invision (J & J); custom color No. 952-05091-3B.

B. Fiber Content: Solutia Ultron VIP nylon 6,6 BCF w/ Permanent Static Protection.

C. Face Construction: Inter-Lok Tufting System

D. Dye Method: Skein

E. Gauge: 1/10

F. Thickness: .219 inch.

G. Surface Pile Weight: 38 oz./sq. yd.

H. Primary Backing: Synthetic.

I. Secondary Backing: LifeSpan.

J. Width: 12 feet

K. Performance Characteristics: As follows:
1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
4. Static Propensity: 3.5 KV or less

L. Five percent overstock for end user.

2.5 CARPET E

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following to match existing:
1. Cantomar by DesignWeave; No. Z6324, color 00366 Taos.

B. Fiber Content: Solution dyed nylon

C. Face Construction: Loop Pile Graphic.

D. Gauge: 5/64

E. Stitches: 6.5 per inch (mm).

F. Thickness: .187 inch.

G. Surface Pile Weight: 26 oz./sq. yd.

H. Primary Backing: Woven Polypropylene.

I. Secondary Backing: Action Bac.

J. Width: 12 feet

K. Performance Characteristics: As follows:
1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
4. Static Propensity: 3.5 KV or less

2.6 CARPET F

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following to match existing:
1. Prestige, by J & J Commercial; custom color No. 952-05091-9.

B. Fiber Content: 100 percent Antron Legacy Nylon, Bulked Continuous Filament, Plied Heat Set w/ DuraTech.

C. Face Construction: TechnoWeave I

D. Dye Method: Beck dyed.

E. Gauge: 1/8

F. Thickness: .255 inch

K. Performance Characteristics: As follows:
1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
4. Static Propensity: 3.0 KV or less

2.7 CARPET G

A. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following to match existing:
1. Prestige, by J & J Commercial; custom color No. 952-05091-9B.

B. Fiber Content: 100 percent Antron Legacy Nylon, Bulked Continuous Filament, Plied Heat Set w/ DuraTech.

C. Face Construction: TechnoWeave I

D. Dye Method: Beck dyed.

E. Gauge: 1/8

F. Thickness: .255 inch.

G. Surface Pile Weight: 42 oz./sq. yd.

H. Primary Backing: Woven polypropylene.

I. Secondary Backing: LifeSpan.

J. Width: 12 feet

K. Performance Characteristics: As follows:
1. Pill Test: CPSC-FF-1-70 (ASTM D2859) passes
2. Flooring Radiant Panel: NFPA-253 (ASTM E648) Direct Glue Down Mode – Class 1
3. NBS Smoke Chamber: NFPA-258 (ASTM E662) Flaming Mode – 450 or less
4. Static Propensity: 3.0 KV or less

2.8 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:
1. Carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the following:
1. Carpet manufacturer.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Primer: Provide products recommended by carpet manufacturer. Provide primer that is compatible with adhesive.

E. Transition Strips: Refer to Division 9 section "Resilient Tile Flooring".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

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 that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the following:
   a. Carpet manufacturer.
2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Moisture and Surface Alkalinity Testing:
1. Moisture Testing: Conduct test of concrete utilizing anhydrous calcium chloride moisture test kit. Proceed with carpet installation only when moisture emission does not exceed 3 lbs (1.4 kg) per 1000 square feet per 24 hours.
2. Surface Alkalinity Testing: Test for pH with a range of 5 – 9 being acceptable.

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

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Cut carpet bales open to full length of rolls to allow the carpet to ventilate a minimum of 72 hours prior to installation.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

D. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:
   1. Carpet manufacturer.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

F. If alkaline content is greater than 9, or is such that it may cause future delaminating of the carpet, per manufacturer's printed instructions, apply carpet manufacturer's recommended primer, adhesives and seam sealers. Provide written disclosures for material, adhesives, and seam sealers.

3.3 INSTALLATION

A. Direct-Glue-Down Installation: Install carpet in strict accordance with the Carpet and Rug Institute's IAQ (indoor air quality) Installation guidelines as well as with the U.S. Environmental Protection Agency's guidelines. Install carpet in accordance with the recommendations in CRI 104 and the carpet manufacturer's specifications.

B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

3.5 BUILDING VENTILATION

A. Operate the building ventilation systems at maximum outdoor air flow before, during and 72 hours after the new carpet installation. Open windows and/or doors when possible during the carpet installation.

END OF SECTION 09680

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:
   1. Exposed exterior items and surfaces.
   2. Exposed interior items and surfaces.
   3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
   4. Refinishing of relocated wood doors.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork and casework.
      b. Acoustical wall panels.
      c. Plastic laminate toilet enclosures.
      d. Elevator equipment.
      e. Finished mechanical and electrical equipment.
      f. Light fixtures.
      g. Distribution cabinets.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Ceiling plenums.
      d. Utility tunnels.
      e. Pipe spaces.

f. Duct shafts.
g. Elevator shafts.

3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
   2. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
   3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
   4. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
   3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
   4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
   5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.
   1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

B. Samples for Selection: Manufacturer's color chips showing the full range of colors available for each type of finish-coat material indicated.
1. After color selection, the Architect will furnish color list of color selections for surfaces to be coated.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.
1. Listed colors as based on Benjamin Moore products. Other manufacturers may be used but will have to provide mockups to verify color selections.
2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
   a. Wall Surfaces: Provide samples on at least 100 sq. ft. (9 sq. m) of wall surface.
   b. Small Areas and Items: The Architect will designate an item or area as required.
3. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
   a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
4. Final approval of colors will be from job-applied samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (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.

1.7 PROJECT CONDITIONS

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

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 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 manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
   1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
   1. California Paint Co. (Cal).
   2. Benjamin Moore & Co. (Moore).
   3. ICI Dulux Paints (ICI)
   4. PPG Industries, Inc. (PPG).
   5. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality professional 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 manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.
      c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
   3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
      a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
      b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
      c. When transparent finish is required, backprime with spar varnish.
      d. 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 on delivery.
   4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
      a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of 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 paint manufacturer, and touch up with the same primer as the shop coat.
   5. Galvanized Surfaces: Clean galvanized surfaces with a palm sander and 60 grit sandpaper so surface is free of surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when 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.
1. Do not tint prime or base coats for multi-colored finishes.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
9. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
2. Heat exchangers.
3. Tanks.
4. Ductwork.
5. Insulation.
6. Motors and mechanical equipment.
7. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:
1. Conduit and fittings.
2. Switchgear.
3. Panelboards.

H. Rated Partition Labeling: Partitions in the construction area that are shown to have a fire or smoke rating shall be labeled. Label each partitions between 6 and 18 inches above the ceiling. Labels shall consist of 4 inch high letters painted in bright orange color. Place labels approximately 5 feet on center on both sides of wall. Label schedule shall be as follows:
1. For smoke walls: "Smoke Rated Wall"
2. For 1 hour walls: "One Hour Rated Wall"
3. For 2 hour walls: "Two Hour Rated Wall"

I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

J. 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.

K. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting,

holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

L. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
1. Provide satin finish for final coats.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

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

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer.
1) Cal: Larcoloid Latex Metal Primer 51108.
2) ICI: 4020-XXXX, Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish.
3) Moore: DTM Acrylic Semi-Gloss M29.
4) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
5) S-W: DTM Acrylic Primer/Finish B66W1 Series.
b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer.
1) Cal: 100 % Acrylic Latex Satin Gloss 2010 402XX.
2) ICI: 4206-XXXX, Devflex Interior/Exterior Acrylic Semi-Gloss Enamel.
3) Moore: DTM Acrylic Semi-Gloss M29.

4) PPG: Speedhide Exterior Semi-Gloss Latex, 6-900 Series.
5) S-W: DTM Acrylic Coating Gloss (Waterborne) B66W200 Series.

3.7 INTERIOR PAINT SCHEDULE

A. Concrete (Other than Concrete Masonry Units): Provide the following paint systems over interior concrete surfaces:
1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Alkali-resistant, acrylic-latex, interior primer applied at spreading rate recommended by the manufacturer.
1) Cal: ProPrime Undercoater Primer-Sealer 54500.
2) ICI: 3210, Ultra-Hide Aquacrylic Gripper Stain Killer Primer-Sealer.
3) Moore: Super Spec Latex Enamel Undercoater & Primer Sealer #253.
4) PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
5) S-W: PrepRite Masonry Primer, B28W300 Series.
b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer.
1) Cal: Premium 100% Acrylic Latex Eggshell 531XX.
2) ICI: 1412-XXXX, Ultra-Hide Latex Eggshell.
3) Moore: Super Spec Latex Eggshell Enamel #274.
4) PPG: Speedhide Interior Eggshell Latex Enamel, 6-411 Series.
5) S-W: ProMar 200 Interior Latex Eggshell, B20W200 Series.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Flat Acrylic Ceiling Finish: 2 finish coats over a primer.
a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer.
1) Cal: ProPrime Undercoater Primer-Sealer 54500.
2) ICI: 1000-1200, Dulux Ultra Interior Latex Wall Primer.
3) Moore: Super Spec Latex Enamel Undercoater & Primer Sealer #253.
4) PPG: Speedhide Interior Latex Primer Sealer, 6-2.
5) S-W: PrepRite 200 Latex Primer B28W200 Series.
b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer.
1) Cal: Premium Acrylic Latex Flat 533XX.
2) ICI: 1210-XXXX, Ultra-Hide Latex Flat Interior Wall Paint.
3) Moore: Super Spec Latex Flat #275.
4) PPG: Speedhide Interior Flat Latex, 6-70 Series.
5) S-W: ProMar 200 Latex Flat Wall Paint B30W200 Series.
2. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer.
1) Cal: ProPrime Undercoater Primer-Sealer 54500.
2) ICI: 1000-1200, Dulux Ultra Interior Latex Wall Primer.
3) Moore: Super Spec Latex Enamel Undercoater & Primer Sealer #253.
4) PPG: Speedhide Interior Latex Primer Sealer, 6-2.
5) S-W: PrepRite 200 Latex Primer B28W200 Series.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer.
   1) Cal: Premium 100% Acrylic Latex Eggshell 531XX.
   2) ICI: 1412-XXXX, Ultra-Hide Latex Eggshell.
   3) Moore: Super Spec Latex Eggshell Enamel #274.
   4) PPG: Speedhide Interior Eggshell Latex Enamel, 6-411 Series.
   5) S-W: ProMar 200 Interior Latex Eggshell B20W200 Series.

C. Ferrous Metal: Provide the following finish systems over ferrous metal:
   1. Semigloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.
      a. Primer (touch-up): Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer.
         1) Cal: Larcoloid Rust Inhibiting Metal Primer 21150.
         2) ICI: 4020-1000, Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish.
         3) Moore: IronClad Latex Low Lustre Metal & Wood Enamel #363.
         4) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
         5) S-W: DTM Acrylic Primer/Finish B66W1 Series.
      b. Undercoat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer.
         1) Cal: Premium 100% Acrylic Semi-Gloss 563XX.
         2) ICI: 1416-XXXX, Ultra-Hide Latex Semi-Gloss Interior Wall and Trim Enamel.
         3) Moore: Super Spec Latex Semi-Gloss Enamel #276.
         4) PPG: Speedhide Interior Semi-Gloss Latex Enamel, 6-510 Series.
         5) S-W: ProMar 200 Interior Latex Semi-Gloss B31W200 Series.
      c. Finish Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer.
         1) ICI: 1416-XXXX, Ultra-Hide Latex Semi-Gloss Interior Wall and Trim Enamel.
         2) Cal: Premium 100% Acrylic Semi-Gloss 563XX.
         3) Moore: Super Spec Latex Semi-Gloss Enamel #276.
         4) PPG: Speedhide Interior Semi-Gloss Latex Enamel, 6-510 Series.
         5) S-W: ProMar 200 Interior Latex Semi-Gloss B31W200 Series.

END OF SECTION 09900

SECTION 10100

VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Porcelain enamel markerboards.

1.3 SUBMITTALS

A. Product Data: For each type of visual display board indicated.

B. Shop Drawings: For each type of visual display board required.
   1. Include dimensioned elevations. Show location of joints between individual panels where unit dimensions exceed maximum panel length.
   2. Include sections of typical trim members.
   3. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display boards through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of visual display boards and are based on the products indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Product Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify field measurements before preparation of Shop Drawings and before fabrication to ensure proper fitting. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating markerboards without field measurements. Coordinate wall construction to ensure actual dimensions correspond to established dimensions.

1.6 WARRANTY

A. General Warranty: The special porcelain enamel markerboard warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.
   1. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Claridge Products and Equipment, Inc.
   2. Ghent Manufacturing, Inc.
   3. Greensteel, Inc.

2.2 MATERIALS

A. Porcelain Enamel Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.
   1. Face Sheet: 0.024-inch (0.61-mm) enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F (649 deg C).

a. Cover Coat: Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.

2. Core: 3/8-inch- (9.5-mm-) thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
3. Backing Sheet: 0.015-inch- (0.38-mm-) thick, aluminum-sheet backing.
4. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.

2.3 ACCESSORIES

A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch- (1.57-mm-) thick, extruded-aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Factory-Built Units: Manufacturer's standard slip-on trim mounted to units of required size. 5/8 inch wide trim with clip angle hangers by Claridge Series 4 or approved substitute.
2. Chalktray: Manufacturer's standard, continuous, solid, extrusion-type, aluminum chalktray with ribbed section and smoothly curved exposed ends for each markerboard.
3. Map Rail: Furnish map rail at top of each unit, complete with the following accessories:
   a. Display Rail: Provide continuous cork display rail approximately 1 inch (25 mm) wide, integral with map rail.
   b. End Stops: Provide one end stop at each end of map rail.

2.4 FABRICATION

A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

B. Assembly: Provide factory-assembled markerboard units, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer's standard vertical joint system between abutting sections of markerboards.

2.5 FINISHES

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

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.
   1. Surfaces to receive markerboards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of markerboards.
   2. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

C. Coordinate units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.3 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

3.4 SCHEDULE

A. Room 518: Where indicated, provide 12 foot long units.

END OF SECTION 10100

SECTION 10155

TOILET COMPARTMENTS

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 toilet compartments and screens as follows:
   1. Type: Solid-plastic, polymer resin.
   2. Compartment Style: Overhead braced and floor anchored.
   3. Screen Style: Wall hung.

B. Related Sections include the following:
   1. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Accurate Partitions Corporation.
   2. General Partitions Mfg. Corp.
   3. Sanymetal.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid-Plastic, Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges in color and pattern as follows:
   1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.
   2. Colors and Patterns: Two colors and patterns in each room as selected by Architect from manufacturer's full range of colors and patterns.

C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.

D. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
   1. Material: Clear-anodized aluminum.

E. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
   1. Material: Stainless steel.

F. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

G. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.

C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

D. Wall-Hung Screens: Provide units in sizes indicated of same construction and finish as compartment panels, unless otherwise indicated.

E. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.
1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
1. Secure panels to walls and panels with not less than 1 full height bracket attached to panel.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners.

Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Screens: Secure screen to wall with two full height brackets, one on each side. Attach with anchoring devices according to manufacturer's written instructions and to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10520

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. Relocation of existing fire-protection cabinets for the following:
      a. Fire hose valves.
      b. Fire hoses and racks.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose racks, and cabinets to verify actual locations of

B. Examine walls and partitions for suitable framing depth and blocking where recessed and

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

3.2 INSTALLATION

A. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
   1. Fasten cabinets to structure, square and plumb.

3.3 INSTALLATION OF FIRE-RATED HOSE OR VALVE CABINETS

A. Install cabinet with not more than 1/16-inch (1.5-mm) tolerance between pipe OD and knockout OD. Center pipe within knockout.

B. Seal through-penetrations with firestopping sealant specified in Division 7 Section "Firestopping."

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during relocation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

SECTION 10801

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 other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Toilet and bath accessories.

B. Related Sections include the following:
1. Division 8 Section "Glazing" for frameless mirrors.

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. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.

C. 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.

D. 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.
1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.

2. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
3. Other manufacturers' products with equal characteristics may be considered. See Division 1 Section "Product Requirements."
4. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

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.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
1. Toilet and Bath Accessories:
   a. American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc.
   c. Bradley Corporation.
   d. McKinney/Parker Washroom Accessories Corp.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

E. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

F. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

G. 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 1-1/2-inch- (38-mm-) 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. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

C. 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.

D. Recessed 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.

E. 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 (1112 N), when tested according to method in ASTM F 446.

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.

3.3 TOILET AND BATH ACCESSORY SCHEDULE

A. Toilet Tissue Dispenser: Where this designation is indicated, install toilet tissue dispenser supplied by the Owner.

B. Soap Dispenser: Where this designation is indicated, install soap dispenser supplied by the Owner.

C. Grab Bars: Where this designation is indicated, provide stainless-steel grab bar complying with the following:
   1. Products: Available products include the following:
      a. Bobrick No. B-5806 Series.
   2. Stainless-Steel Nominal Thickness: Minimum 0.05 inch (1.3 mm).
   3. Mounting: Concealed with manufacturer's standard flanges and anchors.
   4. Gripping Surfaces: Manufacturer's standard slip-resistant texture.
   5. Outside Diameter: 1-1/4 inches (32 mm) for medium-duty applications.

D. Sanitary Napkin Vendor: Where this designation is indicated, provide stainless-steel sanitary napkin vendor complying with the following:
   1. Products: Available products include the following:
      a. Bobrick: B-352 25.
   2. General: Fabricate cabinet of all-welded construction. Provide seamless door with returned edges and secured by tumbler lockset. Provide identification reading "Napkins" and "Tampons"; brand-name advertising is not allowed. Capacity not less than 30 napkins and 27 tampons.
   3. Mounting: Fully recessed type designed for nominal 4-inch (100-mm) wall depth.
   4. Operation: Single-coin operation, 25 cents.

E. Sanitary Napkin Disposal Unit: Where this designation is indicated, provide stainless-steel sanitary napkin disposal unit complying with the following:
   1. Products: Available products include the following:
      a. Bobrick No. B-254.
      b. Bobrick No. B-354.
   2. Surface-Mounted Type: With seamless exposed walls; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.
   3. Partition-Mounted Type: Mounts in partition; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.

F. Warm-Air Dryer: Where this designation is indicated, install warm-air dryer supplied by the Owner.

END OF SECTION 10801

SECTION 11132

PROJECTION SCREENS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Projection screens.

1.2 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.

PART 2 - PRODUCTS

2.1 PROJECTION SCREENS

A. Electrically Operated Screens, General: Provide manufacturer's standard UL-labeled units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Remotely control operation of each screen to comply with the following:
   1. Single-Station Control: 3-position control switch with metal device box and cover plate for flush wall mounting and for connection to 120-V, ac power supply.
   2. Motor: Provide either motor in roller or end-mounted motor.
      a. On right or left end of screen.
   3. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter, metal rod with ends of rod protected by plastic caps. Concealed installation with closure doors.
      a. Roller for end-mounted motor supported by self-aligning bearings in brackets.
      b. Roller for motor in roller supported by vibration-and noise-absorbing supports.
   4. Screen: Vinyl-coated glass-fiber fabric with black masking borders.
      a. Size: 6 feet high by 8 feet wide.
   5. Available Product:
      a. Draper: Envoy
      b. Da-Lite: Director Electrol

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.

3.2 ADJUSTING AND CLEANING

A. Adjust specialties for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

3.3 CLEANING

A. Clean surfaces prior to inspection. Replace damaged or defective items.

END OF SECTION 11132

SECTION 11451

RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Refrigerator/freezers.

1.3 SUBMITTALS

A. Product Data: For each appliance type required indicating compliance with requirements. Include complete operating and maintenance instructions for each appliance.

B. Appliance Schedule: Submit schedule of appliances, using the same room designations shown on Drawings.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the residential appliance manufacturer for both installation and maintenance of appliances required for this Project.

B. Source Limitations: Obtain residential appliances through one source from a single manufacturer.
   1. Provide products from the same manufacturer for each type of appliance required.
   2. To the greatest extent possible, provide appliances by a single manufacturer for entire Project.

C. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of residential appliances and are based on the specific types and models indicated. Other manufacturers' appliances with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

D. Electrical Appliances: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

E. UL and NEMA Compliance: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

F. AGA and ANSI Standards: Provide gas-burning appliances that carry the design certification seal of AGA and that comply with ANSI Z21-Series standards.

G. AHAM Standards: Provide appliances that comply with the following AHAM standards:
   1. Refrigerators and Freezers: Total volume and shelf area ratings certified according to ANSI/AHAM HRF-1.

H. Energy Ratings: Provide residential appliances that carry labels indicating energy-cost analysis (estimated annual operating costs) and efficiency information as required by the Federal Trade Commission.

1.5 DELIVERY

A. Deliver appliances only after utility rough-in is complete and construction in the spaces to receive appliances is substantially complete and ready for installation.

1.6 WARRANTIES

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranties: Written warranties, executed by manufacturer of each appliance specified agreeing to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
   1. Refrigerator/Freezer: Five-year limited warranty on the sealed refrigeration system.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, appliances that may be incorporated into the Work include, but are not limited to, those indicated in the following paragraphs of Part 2.

2.2 RESIDENTIAL APPLIANCES

A. Top-Mount Refrigerator: Where this designation is indicated, provide refrigerator/freezers complying with the following:
   1. Products: Available products include the following:
      a. General Electric: TBX24JABWW

2. Type: Freestanding, frost-free, two-door, top-mount freezer refrigerator/freezer with ABS thermoplastic-copolymer interior cabinet liners.
3. Refrigerator Storage Capacity: 23.6 cubic foot (.67 cubic meter) total interior refrigerator volume measured according to ANSI/AHAM HRF-1 and certified by AHAM.
   a. Fresh Food Compartment Volume: 16.35 cubic foot (.46 cubic meter)
   b. Freezer Compartment Volume: 7.2 cubic foot (.20 cubic meter)
4. Refrigerator Shelf Area: 29.2 square feet (2.71 sq. m) total interior refrigerator shelf area measured according to ANSI/AHAM HRF-1 and certified by AHAM.
5. Temperature Controls: Separate temperature controls for each compartment and a switch for condensation-control heating element at freezer opening.
6. Standard storage features include the following:
   a. Fresh Food Compartment:
      1) Gallon (Liter) container size door storage shelves.
      2) Vegetable crisper.
      3) Utility bin.
      4) Dairy compartment.
   b. Freezer Compartment:
      1) Door shelves.
      2) Ice storage bin.
      3) Two ice cube trays.
7. Finish: Porcelain enamel on steel.
   a. Color: White.
8. Standard features include the following:
   a. Interior light in fresh food compartment.
   b. Adjustable rollers.
   c. Adjustable compartment shelves.

2.3 FINISHES

A. Porcelain-Enamel Finish: Provide manufacturer's standard factory-applied porcelain-enamel finish over cleaned and pretreated steel sheet. If no color is indicated, provide white.
   1. Color and Gloss: As indicated by manufacturer's designations.
      a. Where residential appliances by more than one manufacturer are installed in the same space, provide units with color matching largest equipment item.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for plumbing, mechanical, and electrical services, with Installer present, to verify actual locations of services before residential appliance installation.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Refer to Divisions 16 for electrical requirements.

3.3 ADJUSTING AND CLEANING

A. Test each item of residential appliances to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from residential appliances and leave units in clean condition, ready for operation.

END OF SECTION 11451

SECTION 12494

ROLLER SHADES

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 roller shades, both manually and motor operated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other Work, operational clearances, and relationship to adjoining work.

C. Samples for Selection: For each colored component of each type of roller shade indicated.
   1. Include similar Samples of accessories involving color selection.

D. Window Treatment Schedule: Include roller shades in schedule using same room designations indicated on Drawings.

E. Product Certificates: For each type of roller shade product, signed by product manufacturer.

F. Product Test Reports: For each type of roller shade product.

G. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
   1. Methods for maintaining roller shades and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.
   4. Motorized shade operator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Flame-Resistance Ratings: Passes NFPA 701.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, and location of installation using same room designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ROOM DARKENING SHADES

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Draper, Manual Flexshades:
      a. Shade Material; Sheerweave Series SW2000/2100 by Phifer.
   2. Substitute products by the following:
      a. Lutron Shading Solutions by Vimco.
      b. Mechoshade.

B. Shade Band Material: PVC-coated fiberglass, 12.0 oz. weight.
   1. Material Width: As required.

2. Bottom Hem: Straight.
3. Material Color: As selected by Architect from manufacturer's full range.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.

D. Direction of Roll: Regular, from back of roller.

E. Mounting Brackets: Galvanized or zinc-plated steel.

F. Shade Operation: Manual; with spring roller lift operator.
1. Pull: Manufacturer's standard hand grip engaged pull.
2. Operating Function: Stop and hold shade at any position in ascending or descending travel.

G. Mounting: Ceiling type mounting on existing Kalwall mullions permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

2.2 COMBINATION ROOM DARKENING/BLACK-OUT SHADES

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. Draper, Access Dual Roller Flexshade:
   a. Shade Material; SunBloc Series SB9000 and Sheerweave Series SW2000/2100 by Phifer.
2. Substitute products by the following:
   a. Lutron Shading Solutions by Vimco.
   b. Mechoshade.

B. Shade Band Material: PVC-coated fiberglass, 12.0 oz. weight.
1. Material Width: As required.
2. Bottom Hem: Straight.
3. Material Color: As selected by Architect from manufacturer's full range.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for one roller shade band per roller, unless otherwise indicated on Drawings.

D. Direction of Roll: Regular, from back of roller.

E. Mounting Brackets: Galvanized or zinc-plated steel.

F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings; removable design for access.

G. Top/Back Cover: L shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

H. Audiovisual Light-Blocking Shades: Designed for eliminating all visible light gaps when shades are fully closed; fabricated from blackout shade band material with fascia, pocket, and bottom bar extended and formed for light-tight joints among shade components and between shade components and adjacent construction.
1. Side Channels, Sill Channel, and Perimeter Seals: Manufacturer's standard design for eliminating light gaps when shades are closed.
2. Shade Band Retention System: Manufacturer's standard design for guiding shade band material through range of travel and holding shade band flat with edges of material within side channels.

I. Shade Operation: Motorized.
1. Operating motor in rollers with group control system, and associated switches.

J. Mounting: Ceiling type mounting on existing Kalwall mullions permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

K. Hold-Down Brackets and Hooks or Pins and Side Channels: Manufacturer's standard for fixing shade in place, keeping shade band material taut, and reducing light gaps when shades are closed.

2.3 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch (6 mm) from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12494

SECTION 13910

FIRE PROTECTION BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler and special collection systems.

1.02 RELATED SECTIONS

A. Section 13925 - Fire Suppression Sprinklers: Sprinkler systems design.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

PART 2 PRODUCTS

2.01 GENERAL SYSTEM AND PRODUCT REQUIREMENTS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Double-Interlock Pre-Action System: Conform to NFPA 13. The Special Collections Area (6th Floor) will be modified to have a double-interlock preaction sprinkler system off of the existing standpipe riser in the southeast stairwell. The valve and controls for this system will be installed in the northeast corner of this stairwell and contained within a steel wiremesh fence.

C. Welding Materials and Procedures: Conform to ASME Code.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10 or ASTM A 53 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A 47 (ASTM A 47M).
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for

galvanized pipe.

5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.03 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches (80 mm): Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.04 GATE VALVES

A. Up to and including 2 inches (50 mm):
   1. Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 2 inches (50 mm):
   1. Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, handwheel, OS&Y, solid rubber covered bronze or cast iron wedge, flanged ends.

C. Over 4 inches (100 mm):
   1. Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

2.05 DRAIN VALVES

A. Compression Stop:
   1. Bronze with hose thread nipple and cap.

B. Ball Valve:
   1. Brass with cap and chain, 3/4 inch (20 mm) hose thread.

PART 3 EXECUTION

3.01 INSTALLATION

A. The installed sprinkler system will be modified as indicated on the drawings and in accordance with the floor plan modifications in compliance with NFPA 13. The basement and floors 1 through 4 will have the On-Off heads replaced with standard heads of the same style (pendant, semi-recessed, sidewall or upright) that have a 165 degree thermal element (Add alternate #2). The piping and head locations on these floors will be modified to conform to the revised floor plans. On floors 5 thru 7 the existing system (including the relocation of hose cabinets – depicted on Plumbing drawings) will just be modified to conform to the partitioning and floor plans. There are no On-Off heads on these upper three floors.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls and floors. Seal all penetrations. Firestopping will be performed under Division 7, Section 07841, Firestopping.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Where present ductwork obstructs or interferes with the proper coverage of a sprinkler head install another head below the duct to correct this problem.

H. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09900.

K. Do not penetrate building structural members unless indicated.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings.

Ensure flanges, union, and couplings for servicing are consistently provided.

M. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

N. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION 13910

SECTION 13925

FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cross-linked, Double-Interlock, Pre-action sprinkler system.

B. System design, installation, and certification.

1.02 RELATED SECTIONS

A. Section 13910 - Fire Protection Basic Materials and Methods: Pipe, fittings, and valves.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

PART 2 PRODUCTS

2.01 SPRINKLERS

A. Suspended Ceiling Type: Standard pendant type with matching push on escutcheon plate.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

B. Exposed Area Type: Standard upright type with guard when indicated .
   1. Finish: Brass.
   2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate and guard when indicated.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Dry Sprinklers: Standard pendant type with matching push on escutcheon plate.
   1. Finish: Chrome plated.
   2. Escutcheon Plate Finish: Chrome plated.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

F. Spray Nozzles: Brass with solid cone discharge, 30 degrees of arc.

2.02 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with accelerator; with test and drain valve.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

2.03 AIR COMPRESSOR

A. Compressor: Single unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G. Install air compressor on vibration isolators.

H. Flush entire piping system of foreign matter.

I. Install guards on sprinklers where indicated.

J. Hydrostatically test entire system.

3.02 SCHEDULES

A. System Hazard Areas:
   1. Sixth Floor Special Collections: Ordinary Hazard, Group I, Cross-linked, double-interlock, preaction - remove existing standard wet system as required.
   2. Remaining Area - Top Three Floors: Ordinary Hazard, Group 1 - Existing Standard Wet System to remain.
   3. Lower Five Floors: Ordinary Hazard, Group 1, - Existing Standard Wet System – (Remove existing On-Off Heads and replace with standard heads – Add Alternate #2).

END OF SECTION 13925

SECTION 14210

ELECTRIC TRACTION ELEVATORS

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 electric traction passenger elevators.
   1. Seismic switches required by ASME A17.1 are included.

B. This section also includes the replacement of the controller on the existing traction elevator to meet the requirements of paragraph 1.5, D in these specifications.

C. Related Sections include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
   2. Division 5 Section "Metal Fabrications" for the following:
      a. Attachment plates and angle brackets for supporting guide-rail brackets.
      b. Machine beams.
      c. Divider beams.
      d. Hoist beams.
      e. Structural-steel shapes for subsills.
      f. Pit ladders.
   3. Division 9 Section "Painting" for field painting hoistway entrances.
   4. Division 9 Section "Ceramic Tile" for finish flooring in elevator cars.
   5. Division 16 Section "Fire Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.
   6. Division 16 Sections for electrical service for elevators to and including fused disconnect switches at machine room door.

1.3 DEFINITIONS

A. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.

B. Shop Drawings: Show plans, elevations, sections, and large-scale details indicating service at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment and signals. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

C. Samples: For exposed finishes of cars, hoistway doors and frames, and signal equipment; 3-inch- (75-mm-) square samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

D. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

E. Maintenance Manuals: Include operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel. Submit for Owner's information at Project closeout as specified in Division 1.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an experienced installer approved by elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with applicable provisions in ASME A17.1, "Safety Code for Elevators and Escalators."
1. Seismic Loads: Peak Velocity Related Acceleration; Av = .12.

C. Accessibility Requirements: In addition to local governing regulations, comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)."

D. The elevator installation shall be a design that can be maintainable by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.

1.6 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders, sumps, and floor drains in pits; entrance subsills; and electrical service, electrical outlets, lights, and switches in pits and machine rooms.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by manufacturer agreeing to repair, restore, or replace defective elevator work within specified warranty period.
1. Warranty Period: 12 months from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 18 months' full maintenance service by skilled employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies as used in the manufacture and installation of original equipment.
1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
a. Response Time: Two hours or less.

B. Continuing Maintenance Proposal: Provide a continuing maintenance proposal from Installer to Owner in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electric traction elevators that may be incorporated into the Work include, but are not limited to, the following:
1. Otis Elevator Co.
2. Schindler Elevator Corp.
3. Thyssen Elevator Group North America (Dover).

2.2 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components, published by manufacturer as included in standard preengineered elevator systems and as required for a complete system.

B. Passenger Elevator Machines: Provide variable-voltage, variable-frequency ac-type hoisting machines. Provide solid-state power converters.
   1. Provide non-regenerative system.

C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is specified in another Specification Section.

D. Machine Beams: Provide framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Division 5 Section "Metal Fabrications" for materials and fabrication.

E. Roller Guides: Provide roller guides at top and bottom of car and counterweight frames.

F. Car Frame and Platform: Welded steel units.

G. Finish Materials: Provide the following materials and finishes for exposed parts of elevator car enclosures, car doors, hoistway entrance doors and frames, and signal equipment as indicated:
   1. Satin Stainless Steel: ASTM A 666, Type 304, with No. 4, directional satin finish.
   2. Prime-Painted Steel Sheet: Cold-rolled steel sheet, ASTM A 366/A 366M, or hot-rolled steel sheet, ASTM A 569/A 569M, with factory-applied rust-inhibitive primer.
   3. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications; color, texture, and pattern as selected by Architect from plastic-laminate manufacturer's full range of products.

2.3 OPERATION SYSTEMS

A. Passenger Elevators: Provide manufacturer's standard microprocessor operation system for each elevator or group of elevators as required to provide type of operation system indicated.
   1. Multiple-Car Group: Provide "group automatic operation" as defined in ASME A17.1.

B. Existing Elevator: Replace existing operating system to a system that will be maintainable by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional diagnostic devices, special tools, or instructions from the original equipment manufacturer.

C. Auxiliary Operations: In addition to primary operation system features, provide the following operational features for elevators where indicated:
   1. Independent Service: Keyswitch in car control station removes car from group operation and allows it to respond only to car calls. Key cannot be removed from keyswitch when car is in independent service. When in independent service, doors close only in response to the door close button.

D. Security Features for Elevator: In addition to above operational features, provide the following security features, where indicated. Security features shall not affect emergency firefighters' service.
   1. Keyswitch Feature: Car and hall push buttons are activated and deactivated by security keyswitches. Key is removable only in deactivated position.
      a. Passenger Elevator: Activation to basement by keyswitch only.

2.4 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator or group of elevators with hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements of acrylic or other permanent, nonyellowing translucent plastic.

B. Car Control Stations: Provide fully recessed car control stations with applied metal faceplates. Mount in return panel adjacent to car door, if not otherwise indicated.
   1. Include call buttons for each landing served and other buttons, switches, and controls required for specified car operation.
   2. Mark buttons and switches with manufacturer's standard identification for required use or function that complies with ASME A17.1.
   3. Mount controls at heights complying with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)."

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)." On activation, system dials preprogrammed number of monitoring station and identifies elevator location to monitoring station. System provides two-way voice communication without using a handset and provides visible signals that indicate when system has been activated and when monitoring station has responded. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

D. Car Position Indicator: For passenger elevator cars, provide illuminated-signal type, digital-display type, or segmented type, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
   1. Include travel direction arrows if not provided in car control station.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing for each elevator or group of elevators, but not less than one station for each four elevators in a group. For each group of passenger elevators, locate between two elevators at center of group or at location most convenient for approaching passengers.
   1. Provide units with flat faceplate for mounting with body of unit recessed in wall.
   2. Provide units with direction-indicating buttons; two buttons at intermediate landings; one button at terminal landings.

F. Hall Lanterns: Provide units with illuminated arrows, but provide single arrow at terminal landings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

1. For the record, prepare a written report, endorsed by Installer, listing dimensional discrepancies and conditions detrimental to performance.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to minimize transmission of vibrations to structure and thereby minimize structure-borne noise from elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and direction of travel.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and governing regulations and agencies.

B. Operating Test: Load elevators to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machines during 30-minute test period. Record failure of elevators to perform as required.

SECTION 15000

BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies the basic requirements for mechanical installations and includes requirements common to more than one section. It expands and supplements the requirements specified in sections of Division 1.

1.03 QUALITY ASSURANCE

A. Installer Qualifications All work shall be performed by qualified journeymen of their respective trades who are employed by a firm that can demonstrate successful experience with work similar in type, quality and extent to the work required by this project.

1.04 DRAWINGS AND SPECIFICATIONS

A. The drawings and specifications are complimentary. What is shown or noted on the drawings, but not mentioned in the specifications, automatically becomes a part of the specifications. What is noted in the specifications, but not shown on the drawings, automatically becomes a part of the drawings. Conflicts between the requirements of the drawings and the specifications must be brought to the immediate attention of the Architect/Engineer. The more stringent requirement will apply, unless ruled otherwise by the Architect/Engineer. When conflicts or discrepancies are noted, no work shall proceed until the conflict or discrepancy has been resolved by the Architect/Engineer.

B. The listing of drawings does not limit responsibility of determining full extent of work required by contract drawings. The Subcontractor shall refer to site, architectural, structural, electrical and other drawings and other specification sections that indicate types of construction with which work of this section must be coordinated. The Subcontractor shall review the work with the General Contractor to establish the extent of work for their trade, and to determine whether there will be any interference with the work of other trades. If the work is later found to include work required to complete and coordinate the work or another trade, or to interfere with the work of another trade then the changes required to complete the work or to eliminate the interference shall be made without additional cost to the Owner.

C. The Drawings show, schematically, the order of connection of the various terminal units, but can not show every detail of the piping and ductwork. Whether specifically shown or not, all fixtures shall be connected in accordance with the standard details, accepted trade practice, and the intent of the contract documents. Coordinate with all other trades.

D. Exact locations of ceiling registers and diffusers shall be as shown and detailed on the architectural reflected ceiling plans.

E. System components (Thermostats, sensors, volume dampers, access doors, etc.) System components are identified throughout the drawings for proper system operation. If any component is inadvertently omitted from the drawings, provide that component as per a similar location.

1.05 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

1.06 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to equipment specifications in Divisions 2 through 16, and to approved shop drawings, for rough-in requirements.

1.07 MECHANICAL INSTALLATIONS

A. Coordinate equipment and materials for installation with other building components.

B. Verify all dimensions by field measurements.

C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

D. Coordinate the installation of required supporting devices.

E. Sequence, coordinate and integrate installations of mechanical materials and equipment for efficient flow of the work.

F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

G. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Install access panels to allow access to equipment which require servicing or adjustment.

H. Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, lighting fixtures, and other installations.

1.08 CUTTING AND PATCHING

A. Refer to Division 1 for general requirements for cutting and patching.

B. Refer to Division 16 for requirements for cutting and patching electrical equipment, components, and materials.

C. Do not endanger or damage installed Work through procedures and processes of cutting and patching.

D. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

E. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

F. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. uncover Work to provide for installation of ill-timed Work;

2. remove and replace defective Work;

3. remove and replace Work not conforming to requirements of the Contract Documents;

4. remove samples of installed Work as specified for testing;

5. upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

G. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

H. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1.09 SUBSTITUTIONS

A. Proposals for substitutions of mechanical materials or equipment shall be submitted in conformance with Division 1 requirements. No such substitute materials or equipment shall be incorporated in the work without the written approval of the Architect/Engineer.

B. All substitute materials and equipment submitted for approval must fit within the spaces available with neither substantial alteration to connected piping and ductwork as designed nor increased pressure drops or air friction losses.

C. Approval of substitute materials or equipment by the Architect/Engineer shall not relieve the contractor from his responsibility to provide a complete and workable mechanical system.

D. The Architect/Engineer's decision as to the equality or acceptability of proposed substitutions for the materials and equipment specified shall be final. Any additional costs incurred by such substitutions, including additional costs to other trades, or engineering design costs, shall be borne by the Contractor.

1.10 MECHANICAL SUBMITTALS

A. Refer to Division 1 for submittal definitions, requirements and procedures.

B. Submittal of shop drawings. certified performance data, and samples will be accepted only when submitted by The Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.

C. Submittals for each mechanical trade shall be complete, including all items for which submission and approval is required, and each sheet containing performance data shall be clearly highlighted and marked for the appropriate model or type of equipment to be reviewed. Intended use shall be written on each submittal sheet for each different type of equipment or material to be reviewed (i.e. valves for domestic water or heating hot water, etc.). Incomplete or unmarked submittals WILL BE RETURNED to the Contractor without action.

D. Submittals for HVAC, and Fire Protection shall each be separate and organized by specification section. Mixed submittals will not be processed.

E. When two or more items of same material or equipment are required, i.e., plumbing fixtures, pumps, valves, air handling units, fans, diffusers, registers and grilles, etc., they shall be products of the same manufacturer insofar as possible. This does not apply to raw or bulk materials such as pipe and fittings, sheet metal, etc.

1.11 RECORD DOCUMENTS

A. Refer to Division 1 for requirements.

B. As work progresses, mark Drawings to indicate revisions to piping and ductwork, size and location, including: locations, dampers and other control devices, filters, boxes and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; mains and branches of piping systems, with valves and control devices located and numbered; Change Orders; concealed control system devices.

C. Mark specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

D. At completion of work and prior to final request for payment, the Mechanical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

1.12 OPERATION AND MAINTENANCE DATA

A. Refer to Division 1 for procedures and requirements for preparation and submittal of Operation and Maintenance Manuals.

B. Provide description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

C. Provide manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation control, stopping, shut-down, and emergency instructions; and

summer and winter operating instructions.

D. Provide maintenance procedures for routine preventive maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

E. Provide servicing instructions and lubrication charts and schedules.

F. Provide copies of all approved submittals.

1.13 WARRANTIES

A. Refer to Division 1 for procedures and submittal requirements for warranties. Warranties are required for each item of power driven or other mechanical equipment having moving parts, and wherever else specified in Divisions 13 and 15 of these Specifications.

B. Compile and assemble the warranties specified in Division 13 and 15, into a separated set of vinyl covered, three ring binders, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item, to include date of commencement; duration; and the names, addresses, and telephone numbers and procedures for filing claims and obtaining warranty services.

D. Duration of warranties shall be not less than one year from the date of substantial completion of the facility unless prior approval has been granted in writing by the Architect/Engineer. If the manufacturer's warranty expires less than one year from the date of beneficial occupancy, that warranty service and replacement of parts shall be provided by the mechanical subcontractor at no cost to the Owner.

1.14 CLEANING

A. Refer to Division 1 for general requirements for final cleaning.

B. Refer to Division 15 Section: TESTING, ADJUSTING, AND BALANCING for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

C. All ductwork must be capped during construction, dust and debris in ductwork is not acceptable. Interior of ductwork, and air systems must be completely cleaned.

1.15 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and

efficient flow of installations.

1.16 ENERGY EFFICIENCY

A. All equipment shall meet the minimum energy efficient design standards as established in ASHRAE/IES standard 90.1-1989.

B. All equipment shall have minimum efficiency as described in paragraph 10.4.1 of Standard 90.1-1989, January 1, 1992 requirements. All equipment suppliers must be aware of the requirements and submitted equipment shall meet these minimum requirements.

1.17 DESIGN CRITERIA

A. General Library Spaces:

a. Temperature = 65 to 75 degrees F.
b. Humidity = 30 to 40 % Relative Humidity
c. Ventilation = CO2 control of Outside Air Quantities
d. Filtration = Standard 2" pleated Media – 25 to 30% Eff. IAW ASHRAE 52.1-92.

B. Special Collections Areas:

a. Temperature = 66 to 74 degrees F.
b. Humidity = 25 to 35 % Relative Humidity
c. Ventilation = CO2 control of Outside Air Quantities
d. Filtration = Standard HEPA filters – 99.97% Eff. IAW ASHRAE 52.1-92.

1.18 DIVISION OF RESPONSIBILITY FOR MECHANICAL AND ELECTRICAL USE

A. In general, all line voltage switches, fused switches, outlets, motor starters, power wiring and fuses necessary to connect and operate all electrically powered equipment specified herein will be furnished and installed as a part of the total project. Coordinate work with Electrical Division 16. The intent is to have a complete working system. The Architect/Engineer takes no responsibility for who furnishes and installs the equipment necessary to provide for the complete system.

B. Starters where not specified in Division 15, shall be furnished and installed under Division 16.

C. All power wiring for mechanical equipment shall be furnished and installed as specified under Division 16000.

D. All temperature control wiring including interlocks shall be furnished and installed under Division 15.

E. Disconnect switches where not specified in Division 15, shall be furnished and installed under Division 16.

END OF SECTION 15000

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.

2.02 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.03 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify valves in main and branch piping with tags.

H. Identify air terminal units and radiator valves with numbered tags.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch (20 mm) diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 15075

SECTION 15082

PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.
   1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum service temperature: 850 degrees F (454 degrees C).
   3. Maximum moisture absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96 of 0.02 perm-inches (0.029 ng/Pa s m).

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Flexible cellular elastomeric insulation, complying with ASTM C 534, in molded or sheet form.
   1. 'K' ('Ksi') value: ASTM C 177; 0.27 at 75 degrees F (0.04 at 24 degrees C).
   2. Minimum Service Temperature: -40 degrees F (-40 degrees C).
   3. Maximum Service Temperature: 220 degrees F (104 degrees C).
   4. Maximum Moisture Absorption - Pipe Insulation: 3.5 percent, by weight, when tested in accordance with ASTM D 1056.
   5. Water Vapor Permeability: 0.20 perm-inches, when tested in accordance with ASTM E 96.
   6. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum service temperature: 0 degrees F (-18 degrees C).

b. Maximum service temperature: 150 degrees F (66 degrees C).
c. Moisture vapor transmission: ASTM E 96; 0.002 perm-inches.
d. Thickness: 10 mil (0.25 mm).
e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B 209 (ASTM B 209M) formed aluminum sheet.
1. Thickness: 0.016 inch (0.40 mm) sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07840.

3.02 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply:
      a. Glass Fiber Insulation: 1 inch or smaller = 1/2" thickness. Over 1 inch up to and including 2" = 1" thickness. Piping over 2" in size = 1.5 inch thickness.
   2. Domestic Hot Water Recirculation: Same as Hot Water Supply above.
   3. Domestic Cold Water: Cellular foam - Pipes 1" and samller = 1/2" thickness. Pipes 1.25 inch to 2" = 3/4" thickness. Pipes over 2" = 1" thickness.
   4. Roof Drain Bodies: Cellular Foam - 1" thickness.
   5. Roof Drainage Above Grade: Cellular Foam - 1/2" thickness.

B. Heating Systems:
   1. Heating Water Supply and Return: Glass Fiber - 1" or smaller = 1" thickness. Above 1" in pipe size = 1.5" thickness. NOTE: In the existing building insulate ONLY NEW pipes. The existing hot water piping that is to remain will not be insulated.

C. Cooling Systems:
   1. Chilled water (CHWS, CHWR): Flexible Elastomeric Cellular (with aluminum jacket where exterior to the building). Pipes 1" and less: = 1/2" thickness; pipes up to 2": = 3/4" thickness; pipes above 2": = 1" thickness.

END OF SECTION 15082

SECTION 15083

PIPING SAFETY COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping Safety Covers.

1.02 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 1997.

B. ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 1998.

C. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 1997.

PART 2 PRODUCTS

2.01 PIPING INSULATION ACCESSORIES

A. Provide products that comply with the following:
   1. Americans With Disabilities Act (ADA), Article 4.19.4.

B. Piping Safety Covers: Truebro Lav-Guard.
   1. Characteristics: One-piece vinyl components, minimum 1/8 inch (3 mm) wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
   2. Vinyl material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non yellowing; having the following performance characteristics:
      a. Burning characteristics, when tested in accordance with ASTM D 635: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB).
      b. Thermal conductivity, when tested in accordance with ASTM C 177: K-value 1.17 (2.02).
      c. Indentation hardness, when tested in accordance with ASTM D 2240: 60 Shore A, minimum.
   3. Trap assembly cover: Three-piece assembly, with removable clean-out nut enclosure.
   4. Angle stop covers: Formed with hinged cap for access to valve without requiring cover removal.
   5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
   6. Color: China White, gloss finish; paintable.
   7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not

permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping configurations are correct type for piping cover component configurations specified.

3.02 INSTALLATION

A. Install products of this section in accordance with manufacturer's printed installation instructions.

END OF SECTION 15083

SECTION 15084

EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C 612 or ASTM C 592; rigid, noncombustible.
   1. 'K' ('Ksi') Value: 0.24 at 75 degrees F (0.035 at 24 degrees C), when tested in accordance with ASTM C 177 or ASTM C 518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).
   3. Maximum Moisture Absorption: 0.1 percent by volume.
   4. Density: 1.0 lb/cu ft (16 kg/cu m).

B. Vapor Barrier Jacket:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E 96; 0.02 perm.
   3. Secure with self-sealing longitudinal laps and butt strips.
   4. Secure with outward clinch expanding staples and vapor barrier mastic.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Flexible cellular elastomeric insulation, complying with ASTM C 534, in molded or sheet form.
   1. 'K' ('Ksi') Value: 0.25 (0.032) at 75 degrees F (24 degrees C).
   2. Minimum Service Temperature: -40 degrees F (-40 degrees C).
   3. Maximum Service Temperature: 220 degrees F (104 degrees C).
   4. Water Absorption: 1.0 percent by weight, maximum, when tested in accordance with ASTM D 1056.
   5. Water Vapor Permeability: 0.05 perm-inches (0.05 metric perm cm), maximum, when tested in accordance with ASTM E 96.
   6. Connection: Waterproof vapor barrier adhesive.

2.04 JACKETS

A. PVC Plastic:
   1. Jacket: Sheet material, off-white color.
      a. Minimum Service Temperature: -40 degrees F (-40 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Transmission: ASTM E 96; 0.002 perm-inches.
      d. Thickness: 10 mil (0.25 mm).
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B 209 (ASTM B 209M) formed aluminum sheet.
   1. Thickness: 0.016 inch (0.40 mm) sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   4. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.010 inch (0.25 mm) thick stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 15084

SECTION 15086

DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C 553; flexible, noncombustible blanket.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture vapor transmission: ASTM E 96; 0.02 perm.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.03 DUCT LINER

A. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21 impregnated surface and edge coat.
   1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F (0.045 at 24 degrees C).
   2. Service Temperature: Up to 250 degrees F (121 degrees C).
   3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
   4. Minimum Noise Reduction Coefficients:
      a. 1/2 inch (13 mm) Thickness: 0.30.

B. Adhesive: Waterproof, fire-retardant type.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.03 SCHEDULES

A. Outside Air Intake Ducts: 2" thick rigid glass fiber.

B. Supply Ducts: 1 1/2" flexible glass fiber. NOTE: Ducts exposed to the conditioned space do not require insulation.

END OF SECTION 15086

SECTION 15145

PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Domestic water.
   3. Gas.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D 2729.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D 2564 solvent cement.

2.02 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

2.03 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A 53 Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, forged steel welding type.
   2. Joints: NFPA 54, threaded or welded to ASME B31.1.

2.04 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch (25 mm):
   1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
5. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

B. Plumbing Piping - Water:
1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.

2.06 BALL VALVES

A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.07 FLOW CONTROLS

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi (24 kPa kPa).

2.08 SWING CHECK VALVES

A. Up to 2 Inches (50 mm):
1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder

ends.

2.09 RELIEF VALVES

A. Temperature and Pressure Relief:
   1. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME (BPV IV) certified and labelled.

2.10 STRAINERS

A. Size 2 inch (50 mm) and Under:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom, conserve space, and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

F. Install water piping to ASME B31.9.

G. PVC Pipe: Make solvent-welded joints in accordance with ASTM D 2855.

H. Sleeve pipes passing through partitions, walls and floors. Seal all penetrations. Firestopping will be performed under Division 7, Section 07841, Firestopping.

I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.

END OF SECTION 15145

SECTION 15146

PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof and floor drains.

B. Cleanouts.

C. Water hammer arrestors.

PART 2 PRODUCTS

2.01 DRAINS

A. Floor Drain (FD-1):
   1. ASME A112.21.1M; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.02 CLEANOUTS

A. Cleanouts at Interior Finished Floor Areas :
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

B. Cleanouts at Interior Finished Wall Areas :
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.03 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range-100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install floor cleanouts at elevation to accommodate finished floor.

C. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks water closets and urinals.

END OF SECTION 15146

SECTION 15182

HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. Heating water piping system.
   2. Chilled water piping system.

B. Valves:
   1. Ball valves.
   2. Check valves.

1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Use grooved mechanical couplings and fasteners in accessible locations.

C. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

D. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

E. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

F. Use spring loaded check valves on discharge of heating hot water or chilled water pumps.

PART 2 PRODUCTS

2.01 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A 53, Schedule 40, black.
   1. Fittings: ASTM B 16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type fittings.
   2. Joints: Threaded, or AWS D1.1 welded.

B. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
3. Joints: Solder, lead free, 95-5 tin-antimony, or tin and silver.

2.02 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A 53, Schedule 40, black.
   1. Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type.
   2. Joints: Threaded or AWS D1.1 welded.

B. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), hard drawn.
   1. Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
   2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
   3. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.

2.03 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.

E. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.

F. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

G. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.

H. Wall Support for Pipe Sizes to 3 Inches (76 mm): Cast iron hook.

I. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

J. Wall Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

K. Vertical Support: Steel riser clamp.

L. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

M. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

N. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

O. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

P. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

Q. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches (50 mm) and Under:

B. Flanges for Pipe Over 2 Inches (50 mm):

2.05 BALL VALVES

A. Up To and Including 2 Inches (50 mm):
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.06 SWING CHECK VALVES

A. Up To and Including 2 Inches (50 mm):
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

2.07 FLOW CONTROLS

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi psi (24 kPa kPa).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water and piping to ASME B31.9 requirements. Install chilled water piping to ASME B31.5 requirements.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipes passing through partitions, walls and floors. Seal all penetrations. Firestopping will be performed under Division 7, Section 07841, Firestopping.

G. Slope piping and arrange to drain at low points.

H. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.

END OF SECTION 15182

SECTION 15183

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Pump suction fittings.

F. Flow indicators, controls, meters.

G. Relief valves.

H. Glycol specialties.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

A. Construction: Closed, welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); cleaned, prime coated, and supplied with steel support saddles; with tappings for installation of accessories.
   1. Pressure rating: 100 psi (690 kPa).
   2. Size: As scheduled on the drawings.

2.02 DIAPHRAGM-TYPE EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psi (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel support stand.

B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi (80 kPa).

C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.03 AIR VENTS

A. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.

2.04 AIR SEPARATORS

A. In-line Air Separators:
   1. Cast brass for sizes 1-1/2 inch (40 mm) and smaller, or steel for sizes 2 inch (50 mm) and larger; tested and stamped in accordance with ASME (BPV VIII, 1); for 125 psi (860 kPa) operating pressure.

2.05 STRAINERS

A. Size 2 inch (50 mm) and Under:
   1. Screwed brass or iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

2.06 SUCTION DIFFUSERS

A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch (50 mm) and smaller, flanged for 2-1/2 inch (65 mm) and larger, rated for 175 psi (1200 kPa) working pressure, with inlet vanes, cylinder strainer with 3/16 inch (5 mm) diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

B. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

2.07 FLOW CONTROLS

A. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

C. Accessories: In-line strainer on inlet and ball valve on outlet.

2.08 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.09 GLYCOL SYSTEM

A. Glycol Solution:
   1. Inhibited propylene glycol and water solution mixed 47 percent glycol - 53 percent water, suitable for operating temperatures from -20 degrees F (-29 degrees C) to 250 degrees F

(121 degrees C). **This solution is required in both the heating and cooling systems.**

PART 3 EXECUTION

3.01 INSTALLATION

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

B. Provide manual air vents at system high points and as indicated.

C. Provide air separator on suction side of system circulation pump and connect to expansion tank.

D. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.

E. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.

F. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

G. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

H. Pipe relief valve outlet to nearest floor drain.

I. Clean and flush glycol system before adding glycol solution.

J. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

K. Perform tests determining strength of glycol and water solution and submit written test results.

END OF SECTION 15183

SECTION 15188

HVAC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. In-line circulators.

B. Vertical in-line pumps.

C. Base mounted pumps.

1.02 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

PART 2 PRODUCTS

2.01 SYSTEM LUBRICATED CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psi (965 kPa) maximum working pressure, 230 degrees F (110 degrees C) maximum water temperature.

B. Casing: Cast iron with flanged pump connections.

C. Impeller, Shaft, Rotor: Stainless Steel.

D. Bearings: Metal Impregnated carbon (graphite) and ceramic.

E. Motor: Impedance protected, multiple speed, with external speed selector.

2.02 IN-LINE CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi (860 kPa) maximum working pressure.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Oil-lubricated bronze sleeve.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous operating temperature.

G. Drive: Flexible coupling.

2.03 VERTICAL IN-LINE PUMPS

A. Type: Vertical, single stage, close coupled, radially split casing, for in-line mounting, for 175 psi (1200 kPa) working pressure.

B. Casing: Cast iron, with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous operating temperature.

2.04 BASE MOUNTED PUMPS

A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for 125 psi (860 kPa) maximum working pressure.

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed to shaft.

D. Bearings: Oil lubricated roller or ball bearings.

E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F. Seal: Mechanical seal, 225 degrees F (107 degrees C) maximum continuous operating temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Cast iron or fabricated steel with integral drain rim. Base-mounted pumps shall be provided with a properly sized inertia-base, filled with concrete and spring isolated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches (102 mm) and over.

D. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E. Provide spring-type, vibration isolation, hangers for the inline pump and rubber flex connections between the pump and thje bulding piping.

F. Check, align, and certify alignment of base mounted pumps prior to start-up.

G. Install base mounted pumps on concrete housekeeping base, with inertial bases, anchor bolts, set and level, and grout in place.

H. Lubricate pumps before start-up.

END OF SECTION 15188

SECTION 15410

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

PART 2 PRODUCTS

2.01 FLUSH VALVE WATER CLOSETS

A. Bowl:
1. ASME A112.19.2M; wall hung, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch (38 mm) top spud, china bolt caps.

B. Flush Valve Manufacturers:
1. Sloan Valve Company; Model 111 ES-S.
2. Substitutions: See Section 01600 - Product Requirements.

C. Sensor Operated Flush Valve:
1. ASME A112.18.1M; concealed rough brass, diaphragm type with low voltage operated solenoid operator, infrared sensor and over-ride button in chrome plated plate, wheel handle stop and vacuum breaker; maximum 1.6 gallon (6 L) flush volume.

D. Seat:
1. Solid black plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

E. Water Closet Carrier:
1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.02 WALL HUNG URINALS

A. Urinal:
   1. ASME A112.19.2M; vitreous china, wall hung washout urinal with shields, integral trap, removable stainless steel strainer, top spud, steel supporting hanger.

B. Flush Valve Manufacturers:
   1. Sloan Valve Company; Model 186-1 ES-S.
   2. Substitutions: See Section 01600 - Product Requirements.

C. Sensor Operated Flush Valve:
   1. ASME A112.18.1M; exposed chrome plated, diaphragm type with low voltage operated solenoid operator, infrared sensor in chrome plated plate, wheel handle stop and vacuum breaker; maximum 1 gallon (4 L) flush volume.

D. Carrier:
   1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.03 LAVATORIES

A. Manufacturers:
   1. American Standard; Model 0476.028 Aqualyn.
   2. Substitutions: See Section 01600 - Product Requirements.

B. Vitreous China Counter Top Basin:
   1. ASME A112.19.2M; vitreous china self-rimming counter top lavatory, 20 x 17 inches (508 x 432 mm) with drillings on 4 inch (100 mm) centers, front overflow, seal of putty, calking, or concealed vinyl gasket.

C. Supply Faucet Manufacturers:
   1. Chicago Faucets; Model 802A-665.

D. Metered Faucet:
   1. ASME A112.18.1M; chrome plated metered mixing faucet with push-button self-closing operated cartridge, aerator and cover plate, open grid strainer.

E. Accessories:
   1. Offset waste with perforated open strainer.
   2. Wheel handle stops.
   3. Rigid supplies.

2.04 SINKS

A. Double Compartment Bowl:
   1. ASME A112.19.3M; 33 x 21.25 x 5.375 inch (828 x 540 x 137 mm) outside dimensions 20 gage (0.9 mm) thick, Type 302 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
      a. Trim: ASME A112.18.1M; chrome plated brass supply with high rise swing spout,

vandal proof water economy aerator with maximum 2.2 gpm (0.14 L/s) flow, indexed lever handles and retractable spray, Chicago Faucets model 200A-L9-320-E3.

b. Accessories: Chrome plated 17 gage (1.3 mm) brass P-trap with clean-out plug and arm with escutcheon, wheel handle stop, rigid supplies.

c. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

2.05 ELECTRIC WATER COOLERS

A. Manufacturers:
1. Halsey Taylor; Model HRFSEBP with remote chiller, SJ8-Q.
2. Substitutions: See Section 01600 - Product Requirements.

B. Contour Bi-Level, Fountain:
1. Both fountains shall include pushbutton on the front. Both shall include countour-formed basins to eliminate splashing and standing water, and shall have rounded corners and edges. Each projector shall be two-stream, mound-building type with integral hood guard and anti-squirt feature. Fountain shall comply with ADA. The manufacturer shall certify the unit to meet the requirements of ANSI/NSF 61, Section 9 and the Safe Drinking Water Act.
2. Chiller (remote) shall deliver:
   a. Capacity: 8.0 gpm (0.5 L/s) of 50 degree F (10 degree C) water with inlet at 80 degree F (27 degree C) and room temperature of 90 degree F (32 degree C).
   b. Electrical: 120 volt, 1 phase, 60 Hertz, 3.5 Full Load amps, 325 Watts.

2.06 SERVICE SINKS

A. Manufacturers:
1. American Standard Inc.; Model 7741.000 Florwell Service Sink.
2. Substitutions: See Section 01600 - Product Requirements.

B. Bowl:
1. ASME A112.19.1M; 28 x 28 x 13 inch (711 x 711 x 330 mm) deep, porcelain enamelled cast iron roll-rim sink, with 13 inch (330 mm) high back, chrome plated strainer, removable, vinyl-coated rim guard, 3" chrome-plated drain grid.

C. Trim:
1. ASME A112.18.1M exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges - Chicago Faucets model 897 RCF.

D. Accessories:
1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.

END OF SECTION 15410

SECTION 15514

FINNED WATER-TUBE BOILERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Boilers.

B. Controls and boiler trim.

C. Hot water connections.

D. Fuel connection.

E. Collector, draft hood, and chimney connection.

1.02 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in University of Southern Maine's name and registered with manufacturer.

1.03 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for heat exchangers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Lochinvar Corporation; Model PBN1000.

2.02 MANUFACTURED UNITS

A. Hot water forced draft boiler with horizontal grid, finned tube heat exchanger, natural gas burning system, refractory combustion chamber, controls, and boiler trim.

B. Electrical Characteristics:
   1. 10 rated load amperes.
   2. 120 volts, single phase, 60 Hz.

2.03 FABRICATION

A. Assembly: Finned copper tube heat exchanger assembled within combustion chamber conforming to ASME (BPV IV) and (BPV VIII, 1) requirements, and tested for maximum working pressure of 160 psi (1100 kPa).

B. Combustion Chamber: Line with interlocking refractory insulating panels of vermiculite, high temperature cements, asbestos fiber and refractory clay for service temperatures to 2100 degrees F (1150 degrees C).

C. Exchanger: Fabricate of finned copper tubing with stainless steel baffles and sealed into bronze, steel, or cast iron headers with silicone O-ring gaskets.

D. Jacket: Galvanized steel with factory applied baked enamel, insulated with foil faced fiberglass insulation.

2.04 FUEL BURNING SYSTEM

A. Induced Draft Gas Burner: Stainless steel burners for on-off firing and natural gas with adjustable combustion air supply, gas pressure regulator, diaphragm gas valves, manual shut-off, intermittent spark or glow coil ignition, thermistor flame sensing device, and automatic 100% safety gas shut-off.

B. Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven allow gas valve to open.

C. Flue Gas Collector and Draft Hood: Integral with boiler casing.

2.05 TRIM

A. ASME rated pressure relief valve set at 45 psi (310 kPa).

B. Low water cut-off and inlet flow switch to automatically prevent burner operation when water falls below safe level or on low flow through boiler.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Install boiler on concrete housekeeping base, sized minimum 4 inches (100 mm) larger than boiler base. Refer to Section 03300.

D. Provide piping connections and accessories as indicated; refer to Section 15183.

E. Pipe relief valves to nearest floor drain.

3.02 MANUFACTURER'S FIELD SERVICES

A. Instruct operating personnel in operation and maintenance of units.

END OF SECTION 15514

SECTION 15622

AIR COOLED WATER CHILLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chiller package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Chilled water connections.

E. Starters.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Provide factory assembled and tested outdoor air cooled liquid chillers consisting of compressors, condenser, evaporator, thermal expansion valve, refrigeration accessories, and control panel. Construction, testing, and ratings shall be in accordance with ARI 550/590.

B. Conform to ASHRAE Std 15 for construction and operation of water chillers.

2.02 HERMETIC COMPRESSORS

A. Scroll Compressors:
   1. Unit: Direct drive, hermetic, 3600 RPM, fixed compression, scroll motor-compressor with control panel.
   2. Features: Centrifugal oil pump, sump oil heater, oil level sight glass, oil charging valve, two point lubrication for each motor bearing, flooded lubrication for the journal and thrust bearings, check valve on scroll discharge port.
   3. Motor: Suction gas cooled, hermetically sealed, squirrel cage induction.
   4. Controls:
      a. Starter section:
      b. Refrigeration section:
      c. Manual reset for compressor overload, high motor temperature, and low and high refrigerant pressure.
   5. Automatic Capacity Reduction: Wire steps to terminal strip, refer to Section 15940.

2.03 SEMI-HERMETIC COMPRESSORS

A. Screw Compressors:
   1. Unit: Direct drive, semi-hermetic 3600 RPM, fixed compression, rotary screw compressor with control panel.
   2. Features: Differential refrigerant pressure oil pump, oil heater, oil separator and filter, oil charging valve.
   3. Motor: Suction gas cooled, hermetically sealed, squirrel cage induction.
   4. Controls:
      a. Non-fused molded case disconnect switch.
      b. Single point power connection and grounding lug.
      c. Anti-recycle timer.
      d. Low and high pressure control.
   5. Automatic Capacity Reduction: Continuously variable slide valve with infinitely variable control to 25 percent of full load.

2.04 EVAPORATOR

A. Provide shell and tube type evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Provide multiple refrigerant circuits on multiple compressor units.

B. Design, test, and stamp refrigerant side for 225 psig (1550 kPa) working pressure and water side for 150 psig (1034 kPa) working pressure, in accordance with ASME (BPV VIII, 1).

C. Insulate with 0.75 inch (20 mm) minimum thick flexible expanded polyvinyl chloride insulation with maximum K value of 0.28. Provide heat tape to protect evaporator to-20 degrees F (-29 degrees C).

D. Provide water drain connection and thermometer wells for temperature controller and low temperature cutout.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install units on spring vibration isolation.

C. Connect to electrical service. Refer to Section 16155.

D. Connect to chilled water piping. Refer to Section 15182.
   1. On inlet, provide:
      a. Thermometer well for temperature controller.
      b. Thermometer well for temperature limit controller.
      c. Flexible pipe connector.

d. Shut-off valve.

2. On outlet, provide:
   a. Thermometer well for temperature controller.
   b. Flexible pipe connector.
   c. Shut-off valve.

E. Arrange piping for easy dismantling to permit tube cleaning.

END OF SECTION 15622

SECTION 15720

AIR HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged air handling units.

1.02 REFERENCES

A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 1999.

B. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; Air Conditioning and Refrigeration Institute; 1991.

C. ARI 430 - Standard for Central-Station Air-Handling Units; Air-Conditioning and Refrigeration Institute; 1999.

D. ARI 610 - Central System Humidifiers for Residential Applications; Air-Conditioning and Refrigeration Institute; 1996.

E. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Published Literature: Indicate dimensions, weights, capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
   2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
   3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
   4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
   5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

PART 2 PRODUCTS

2.01 GENERAL DESCRIPTION

A. Configuration: Fabricate double-walled with fan and coil section plus accessories, including:
   1. Cooling coil section.
   2. Heating coil.
   3. Filter section.

4. Combination filter/mixing box section.
5. And as scheduled on the drawings.

B. Fabrication: Conform to AMCA 99 and ARI 430.

2.02 CASING

A. Construction: Fabricate on channel base and drain pan of welded steel. Assemble sections with gaskets and bolts.
   1. Outside Casing:
      a. Galvanized Steel: 0.0516 inch (1.3 mm).
      b. Finish: Manufacturers standard paint on exterior.
   2. Inside Casing:
      a. Galvanized Steel: Solid, 0.0276 inch (0.7 mm) thick.
   3. Floor Plate:
      a. Galvanized Steel: .1382 inch (3.5 mm) thick.

B. Insulation: Neoprene coated, glass fiber, applied to internal surfaces with adhesive and weld pins with the inner wall entirely encapsulating the insulation.
   1. "K" ("Ksi") value at 75 degrees F (42 degrees C): Maximum 0.26 Btuh/inch/sq ft/degrees F (0.037 W/m/Degree K).
   2. Density: 2 inch (50 mm) thick, 1-1/2 lbs/cu ft (24 kg/cu m).

2.03 FANS

A. Type: Forward curved, single width, single inlet, centrifugal type fan.

2.04 COILS

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch (600 mm) downstream of coil and down spouts for cooling coil banks more than one coil high - stainless steel double sloping.

C. Eliminators: Three break of galvanized steel, mounted over drain pan.

D. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410. Refer to Section 15765.

2.05 FILTERS

A. Flat: (FOR STANDARD AIR HANDLING UNITS) 2 inches (50 mm) deep 30% efficient disposable, extended area panel filters.

B. High Capacity: (FOR SPECIAL COLLECTIONS AIR HANDLING UNITS) deep HEPA 99.97% Efficient

2.06 DAMPERS

A. Mixing Boxes: Section with factory mounted outside and return air dampers of galvanized steel with vinyl bulb edging and edge seals in galvanized frame, with galvanized steel axles in self-lubricating nylon bearings, in parallel blade arrangement with damper blades positioned across short air opening dimension. Provide removable, full width rack for supporting freeze protection thermostat, with removable end panel to permit rack removal.

B. Damper Leakage: Maximum 2 percent at 4 inch wg (1 kPa) differential pressure when sized for 2000 fpm (10 m/s) face velocity.

C. Face and Bypass Dampers: Factory mount in casing with access doors, of galvanized steel blades with vinyl bulb edging and edge seals, galvanized steel frame, and axles in self-lubricating nylon bearings; arrange to match coil face with bottom bypass, blank-off and division sheets, internal linkage, access doors, and adjustable resistance plate.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets. Isolate fan section with flexible duct connections; refer to Section 15910.

C. Provide sheaves required for final air balance.

D. Make connections to coils with unions or flanges.

E. Hydronic Coils:
   1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
   2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
   3. Locate water supply at bottom of supply header and return water connection at top.
   4. Provide manual air vents at high points complete with stop valve.
   5. Ensure water coils are drainable and provide drain connection at low points.

F. Refrigerant Coils: Provide sight glass in liquid line within 12 inches (300 mm) of coil.

G. Insulate coil headers located outside air flow as specified for piping. Refer to Section 15082.

H. Air Filters: Contractor to provide three (3) sets of filters. The first set will be shipped with the unit and remain in place during construction. The seond set will be installed just prior to Testing and Balancing and remain in the unit at turnover. The third set will be turned over to the Owner.

END OF SECTION 15720

SECTION 15755

STEAM HUMIDIFIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrode Steam Humidifiers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nortec Industries. Inc.; Model NHMC.

2.02 ELECTRODE STEAM HUMIDIFIERS

A. Humidifier: ARI 610 Self contained, disposable cylinder, microprocessor controlled electrode steam generating unit.

B. Cylinders: Disposable, polypropylene plastic with field adjustable stainless steel electrodes.

C. Plumbing Components and Valve Bodies: Plastic, linked by flexible rubber hosing. Incorporate water fill with 1 inch (25 mm) air gap and integral air gap on drain. Fill solenoid valve shall incorporate built-in strainer, pressure reducing and flow regulating orifice.

D. Cabinet: Steel, 0.058 inches (1.5 mm) with enamel finish, with hinged and lockable access door.

E. Electric Service: Unit protected by internal fusing on line voltage leads and automatic emergency drain trigger. Incorporate electrical terminals for installation of humidistat, duct high-limit humidistat, interlock to fan or air flow switch.

F. Control: Fully modulating control to provide gradual 0 to 100 percent capacity. Maximum capacity shall be field adjustable for 0 to 100 percent. High water probe shall prevent overfilling. Multiple cylinder humidifiers shall have duplicate internal control circuitry to allow each cylinder to be independently controlled.

G. Drain Cycle: Field adjustable with drain duration range of 2 to 128 seconds and drain interval range of 0.25 to 16 hours, with one drain valve for each generator.

H. Steam Distributor: Stainless steel steam dispersion tube suitable for insertion in duct with condensate separator and return leg to remove condensate from distributor and return to humidifier fill. Steam hose from generator to dispersion tube shall be 1-1/2 inch (40 mm) diameter reinforced rubber.

I. Display: Digital, providing select monitoring of unit amperage draw, percentage demand from humidistat, steam output, and manually set capacity adjustment. Lamps to indicate full cylinder.

J. Humidistat: Wall mounted, solid state electronic sensor, 24 volt.

K. Electrical Characteristics:
1. 480 volts, three phase, 60 Hz.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide galvanized steel rods to support distribution manifolds and mount in air system plenums.

END OF SECTION 15755

SECTION 15762

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finned tube radiation.

1.02 RELATED SECTIONS

A. Section 15182 - Hydronic Piping.

B. Section 15183 - Hydronic Specialties.

C. Section 15940 - HVAC Sequence of Operation.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

PART 2 PRODUCTS

2.01 FINNED TUBE RADIATION

A. Manufacturer:
   1. Sterling Corporation; Model VB-PM-C143.
   2. Substitutions: See Section 01600 - Product Requirements.

B. Heating Elements: 1 inch (25 mm) ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4 1/4" x 4 1/4" (125mm x 125mm, suitable for soldered fittings.

C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

D. Enclosures: 0.0478 inch (1.2 mm) steel up to 18 inches (450 mm) in height, 0.0598 inch (1.5 mm) steel over 18 inches (450 mm) in height, with easily jointed components for wall to wall installation.
   1. Support rigidly, on wall or floor mounted brackets.

E. Finish: Factory applied baked enamel of color as selected.

F. Capacity: As scheduled, based on 65 degree F (18 degree C) entering air temperature, 180

degree F (82 degree C) average water temperature.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

END OF SECTION 15762

SECTION 15810

DUCTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Ducts: ASTM A 653/A 653M galvanized steel sheet, Forming Steel (FS) designation, with G90/Z275 zinc coating.

B. Aluminum Ducts: ASTM B 209 (ASTM B 209M); aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061- T6 or of equivalent strength.

C. Flexible Ducts:
   1. Two ply vinyl film supported by helically wound spring steel wire.
      a. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
      b. Maximum Velocity: 4000 fpm (20.3 m/sec).
      c. Temperature Range: -10 degrees F to 160 degrees F (-23 degrees C to 71 degrees C).

2.02 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

2.03 MANUFACTURED METAL DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

B. Flat Oval Ducts:
   1. Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gages heavier metal than duct.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

E. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.

F. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 SCHEDULES

A. Ductwork Material:
   1. Medium and High Pressure Supply: Steel.
   2. Return and Relief: Steel.

END OF SECTION 15810

SECTION 15820

DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Duct access doors.

C. Flexible duct connections.

D. Volume control dampers.

1.02 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps in accordance with SMACNA duct construction standards.

2.02 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch (25 mm) thick insulation with sheet metal cover.
   1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
   2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.
   3. Up to 24 x 48 inches (600 x 1200 mm): Three hinges and two compression latches with outside and inside handles.

2.03 FLEXIBLE DUCT CONNECTIONS

A. Connector: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
   2. Metal: 3 inches (75 mm) wide, 24 gage (0.6 mm) thick galvanized steel.

2.04 VOLUME CONTROL DAMPERS.

A. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).

B. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
   2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15810 for duct construction and pressure class.

B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and as indicated. Provide 4 x 4 inch (100 x 100 mm) for balancing dampers only. Review locations prior to fabrication.

C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment, and supported by vibration isolators. Refer to Section 15072.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

E. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 15820

SECTION 15833

CENTRIFUGAL FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Radial centrifugal fans.

B. Tubular centrifugal fans.

C. Inline centrifugal fans.

D. Motors and drives.

PART 2 PRODUCTS

2.01 WHEEL AND INLET

A. Radial: Steel construction with inlet flange, heavy reinforced back plate, plate blades with reinforcing gussets welded or riveted to back plate and flange; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

2.02 HOUSING

A. Heavy gage steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut

B. Factory finish before assembly to manufacturer's standard. For fans handling air downstream of humidifiers, provide two additional coats of paint. Prime coating on aluminum parts is not required.

2.03 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA 9 life at 50,000 hours.

B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp (11.2 Kw) and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp (15 Kw) and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

D. Belt Guard: Fabricate to SMACNA Duct Construction Standards - Metal and Flexible; 0.106 inch (2.6 mm) thick, 3/4 inch (20 mm) diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads.

C. Provide adjustable sheaves required for final air balance.

END OF SECTION 15833

SECTION 15840

AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable volume terminal units.

B. Integral heating coils.

C. Integral damper motor operators.

D. Integral controls.

1.02 RELATED SECTIONS

A. Section 15182 - Hydronic Piping: Connections to heating coils.

B. Section 15183 - Hydronic Specialties: Connections to heating coils.

C. Section 15810 - Ducts.

D. Section 15820 - Duct Accessories.

E. Section 15850 - Air Outlets and Inlets.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Ceiling mounted variable air volume supply air control terminals for connection to single duct, central air systems, with DDC variable volume controls,, hot water heating coils.

2.02 SINGLE DUCT VARIABLE VOLUME UNITS

A. Basic Assembly:
   1. Casings: Minimum 22 gage (0.8 mm) galvanized steel.
   2. Lining: Minimum 1/2 inch (13 mm) thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft (24 g/L) density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film.
   3. Plenum Air Inlets: Round stub connections for duct attachment.
   4. Plenum Air Outlets: S slip and drive connections.

B. Basic Unit:
   1. Configuration: Air volume damper assembly inside unit casing. Locate control

components inside protective metal shroud.

2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inches (0.25 kPa) rated inlet static pressure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support units individually from structure. Do not support from adjacent ductwork.

C. Connect to ductwork in accordance with Section 15810.

D. Provide minimum of 5 ft (1.5 m) of 1 inch (25 mm) thick lined ductwork downstream of units.

3.02 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION 15840

SECTION 15850

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

PART 2 PRODUCTS

2.01 ROUND CEILING DIFFUSERS

A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch (25 mm) above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.

B. Fabrication: Steel with baked enamel off-white finish.

C. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Square, stamped, multi-core diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Frame: Surface mount type. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabrication: Steel with baked enamel off-white finish.

D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.03 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory off-white enamel finish.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable

from face.

2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage (0.90 mm) minimum frames and 22 gage (0.80 mm) minimum blades, steel and aluminum with 20 gage (0.90 mm) minimum frame, or aluminum extrusions, with factory off-white enamel finish, color to be selected.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.05 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage (0.90 mm) minimum frames and 22 gage (0.80 mm) minimum blades, steel and aluminum with 20 gage (0.90 mm) minimum frame, or aluminum extrusions, with factory off-white enamel finish, color to be selected.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09900.

END OF SECTION 15850

SECTION 15926

ENERGY MANAGEMENT AND CONTROL SYSTEM

PART 1: GENERAL

1.0 SECTION INCLUDES

1. Products Furnished But Not Installed Under This Section
2. Products Installed But Not Furnished Under This Section
3. Products Not Furnished Or Installed But Integrated With The Work Of This Section
4. Related Sections
5. Description
6. Approved Control System Manufacturers
7. Quality Assurance
8. Codes and Standards
9. System Performance
10. Submittals
11. Warranty
12. Ownership of Proprietary Material

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 15182 - Hydronic Piping:
   1. Control Valves
   2. Flow Switches
   3. Temperature Sensor Wells and Sockets
   4. Flowmeters

B. Section 15820 - Ductwork Accessories:
   1. Automatic Control Dampers
   2. Terminal Unit Controls

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

1.3 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

A. Section 15514 – Finned Water-Tube Boilers:
   1. Boiler Controls

B. Section 15622 – Air Cooled Water Chillers:
   1. Chiller Controls

C. Section 15720 - Air Handling Units:
   1. Discharge Air Temperature Control
   2. Economizer Control
   3. Volume Control
   4. Carbon Dioxide Sensors

D. Section 15762 – Terminal Heat Transfer Units:
   1. Setpoint Reset
   2. Day/Night Indexing

E. Section 15840 - Air Terminal Units:
   1. Cross-Flow Velocity Sensor

F. Section 16420 - Variable Frequency Drives

G. Section 16010 – General Requirements for Electrical Work:
   1. Duct Smoke Detectors

H. Section 15755 – Steam Humidifiers:

I. Section 15833 - Centrifugal Fans:

1.4 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of this specification and shall be used in conjunction with this section as a part of the contract documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

B. The following sections constitute related work:
   1. Section 01770 - Closeout Procedures
   2. Section 15000 - Basic Mechanical Requirements
   3. Section 15622 – Air Cooled Water Chillers
   4. Section 15720 - Air Handling Units
   5. Section 15950 – Testing, Adjusting, and Balancing
   6. Section 16010 - General Requirements for Electrical Work

1.5 DESCRIPTION

A. General: The control system shall be as shown and consist of a high-speed, Ethernet peer-to-peer network of DDC controllers communicating to the existing Delta Controls Orcaview BACnet OWS. All controllers shall be 100% BACnet residing and communicating on a BACnet internetwork. Lonworks/Mark based

systems or any other system not **NATIVE BACnet** are unacceptable. The system shall have new system graphics, trends and alarms created on the existing Delta OWS by the controls contractor.

B. The system will directly control the air-handling units (AHU-5, 6A, 6B and 7) by maintaining discharge air temperature, duct and building static pressure, and outside air CO_2 and economizer control. The hot water boiler and pumping system will operate to reset the hot water supply temperature based upon outside air temperature and pump lead-lag control. The chiller and chilled water pump system will operate based on outside air temperature and pump lead/lag control. In addition, each terminal variable air volume VAV unit will be controlled by individual DDC zone controllers networked with the primary DDC panels. Each zone controller will provide for occupied/unoccupied mode of operation by individual zone. For energy conservation, the system will be programmed for optimal Start/Stop of the air handling units and hot and chilled water systems, night setback, and night purge control.

C. ADD ALTERNATE #3 – Add alternate #3 will remove the existing Pneumatic/DDC Honeywell controls on AHU-1B, 2, 3 and 4 and replace them with controls as described for AHU-5, 6A, 6B and 7 above. See the points lists in paragraph 3.22.

D. The system will provide for future expansion to include monitoring of the card access, fire alarm, and lighting control systems.

1.6 APPROVED CONTROL SYSTEM MANUFACTURERS

A. The following are the approved Control System Manufacturers:

Manufacturer

Alerton Technologies

Automated Logic

Delta Controls

NO SUBSTITUTIONS

Note:

1. The above Manufacturers are listed alphabetically and do not display a preference.

2. The Contractor shall use only products from the corresponding manufacturer and product line listed.

3. The above list of manufacturers applies to operator workstation software, controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (e.g., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.7 QUALITY ASSURANCE

A. Contractor/Manufacturer Qualifications

1. The Installer shall have an established working relationship with the Control System Manufacturer of not less than five years.

2. The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.

3. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract.

5. The local controls contractor shall have local experienced in BACnet installations.

1.8 CODES AND STANDARDS

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)

2. Uniform Building Code (UBC)

   a. Section 608, Shutoff for Smoke Control
   b. Section 403.3, Smoke Detection Group B Office Buildings and Group R, Division 1 Occupancies
   c. Section 710.5, Wiring in Plenums
   d. Section 713.10, Smoke Dampers
   e. Section 1106 Refrigeration Machinery Rooms

f. Section 1107, Refrigeration Machinery Room Ventilation
g. Section 1108, Refrigeration Machinery Room Equipment and Controls
h. Section 1120, Detection and Alarm Systems

3. Uniform Mechanical Code (UMC)

4. ASHRAE 135-1995

5. FCC Regulation, Part 15- Governing Frequency Electromagnetic Interference

6. Underwriters Laboratories
   a. UL916
   b. UL864

1.9 SYSTEM PERFORMANCE

A. Performance Standards. The system shall conform to the following:

1. Graphic Display. The system shall display a graphic with 20 dynamic points/objects with all current data within 10 seconds.

2. Graphic Refresh. The system shall update a graphic with 20 dynamic points/objects with all current data within 8 seconds.

3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be less than 2 seconds. Analog objects should start to adjust within 2 seconds.

4. Object Scan. All changes of state and change of analog values will be transmitted over the high-speed Ethernet network such that any data used or displayed at a controller or workstation will have been current within the previous 60 seconds.

5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

7. Performance. Programmable controllers shall be able to execute DDC PID control loops at a selectable frequency of at least once per second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

8. Multiple Alarm Annunciation. All workstations on the network must receive alarms within 5 seconds of each other.

9. Reporting Accuracy. The system shall report all values with an end-to-end accuracy as listed or better than those listed in Table 1.

10. Stability of Control. Control loops shall maintain measured variable at setpoint within the tolerances listed in Table 2.

Table 1: Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C [±1°F]
Ducted Air	±0.5°C [±1°F
Outside Air	±1.0°C [±2°F]
Dewpoint	±1.5°C [±3°F]
Water Temperature	±0.5°C [±1°F]
Delta-T	±0.15°C[±0.25°F]
Relative Humidity	±5% RH
Water Flow	±5% of full scale
Airflow (terminal)	±10% of full scall *(see Note 1)*
Airflow (measuring stations)	±5% of full scale
Air Pressure (ducts)	±25 Pa [±0.1 "W.G.]
Air Pressure (space)	±3 Pa [±0.01 "W.G.]
Water Pressure	±2% of full scale *(see Note 2)*
Electrical (A, V, W, Power factor)	5% of reading *(see Note 3)*
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm

Note 1: 10%-100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

Table 2: Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa [±0.2" w.g.]	0-1.5 kPa [0-6" w.g.]
	±3 Pa [±0.01" w.g.]	-25 to 25 Pa [-0.1 to 0.1" w.g.]
Airflow	±100 cfm	
Temperature	±0.5°C [±1.0°F]	
Humidity	±5% RH	
Fluid Pressure	±10 kPa [±1.5 psi]	0-1 kPa [1-150 psi]
	±250 Pa [±1.0" w.g.]	0-12.5 kPa [0-50"w.g.] differential

1.10 SUBMITTALS

A. Product Data and Shop Drawings: Meet requirements of Section 01xxx on Shop Drawings, Product Data, and Samples. In addition, Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been reviewed and approved for conformity with the design intent. Six copies are required. All drawings shall be done on AutoCad Release 14.0 or higher, and provided on magnetic/optical disk and as full-size mylar drawings. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfil submittal requirements. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. Direct Digital Control System Hardware:

   a. A complete bill of materials of equipment to be used shall be listed indicating quantity, manufacturer, model number, and other relevant technical data.

   b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:

      1. Direct Digital Controller (controller panels)
      2. Transducers/Transmitters
      3. Sensors (including accuracy data)
      4. Actuators
      5. Valves
      6. Relays/Switches
      7. Control Panels
      8. Power Supply
      9. Batteries
      10. Operator Interface Equipment
      11. Wiring

   c. Wiring diagrams and layouts for each control panel. Show all termination numbers.

   d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.

2. Central System Hardware and Software: **(EXISTING DELTA OWS)**

New System graphics shall be created and shall reside on the existing Delta Controls BACnet OWS.

   a. Provide a detail riser diagrams of wiring between central control unit, operator workstation(s), routers, gateways and all control panels.

   b. A list of the color graphic screens shall be provided. For each screen, provide a conceptual layout of pictures and data, and show or explain which other screens can be directly accessed.

3. Controlled Systems:

   a. A schematic diagram of each controlled system. The schematics shall have all control points/objects labelled and with point/object names shown or listed. The schematics shall graphically show the location of all control elements in the system.

   b. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labelled. Where a control element is the same as that shown on the control system schematic, it shall be labelled with the same name. All terminals shall be labelled.

   c. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.

   d. A mounting, wiring, and routing plan view drawing. The drawing shall be done in ¼" scale. The design shall take into account HVAC, electrical and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.

   e. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.

   f. A point/object list for each system controller including both inputs and outputs (I/O), point/object number, the controlled device associated with the I/O point/object, and the location of the I/O device. Software flag points/objects, alarm points/objects, etc.

4. Quantities of items submitted shall be reviewed, but are the responsibility of the Contractor.

5. A description of the proposed process along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."

6. A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal. PICS to include for each product, as a minimum, a list of BACnet functional groups supported, BACnet services supported, BACnet data link options available and BACnet objects provided.

B. Schedules:

1. Within one month of contract award, provide a schedule of the work indicating the following:
   a. Intended sequence of work items.
   b. Start dates of individual work items.
   c. Duration of individual work items.
   d. Planned delivery dates for major material and equipment, and expected lead times.
   e. Milestones indicating possible restraints on work by other trades or situations.
2. Provide monthly written status reports indicating work completed, revisions to expected delivery dates, etc. An updated project schedule shall be included.

C. Project Record Documents: Upon completion of installation, submit three copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:

1. Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of magnetic media including CAD, .DWG, or .DXF drawing files also shall be provided.

2. Testing and Commissioning Reports and Checklists. Completed versions of all reports and checklists, along with all trend logs, used to meet the requirements of Part 3: "Control System Demonstration and Acceptance."

3. Operation and Maintenance (O & M) Manual. This shall include as-built versions of the submittal product data. In addition to the information required for submittals, the O & M manual shall include:
   a. Names, addresses, and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representatives of each.

   b. Operators Manual with procedures for operating the control systems, including logging on/off, alarm handling, producing point/object reports, trending data, overriding computer control, and changing setpoints and

other variables.

c. One set of Programming Manuals with a description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point/object database creation and modification, program creation and modification, and use of the editor.

d. Engineering, Installation, and Maintenance Manual(s) that explain how to design and install new points/objects, panels, and other hardware; preventive maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.

e. A listing and documentation of all custom software created using the programming language, including the setpoints, tuning parameters, and object database. One set of magnetic/optical media containing files of the software and database also shall be provided.

f. One set of magnetic/optical media containing files of all color graphic screens created for the project.

g. A list of recommended spare parts with part numbers and suppliers.

h. Complete original issue documentation, installation, and maintenance information for all third-party hardware provided, including computer equipment and sensors.

i. Complete original issue diskettes for all software provided, including operating systems, programming language, operator workstation software, and graphics software.

j. Licenses, guarantee, and warranty documents for all equipment and systems.

k. Recommended preventive maintenance procedures for all system components, including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions.

D. Training Manuals: The Contractor shall provide a course outline and training manuals for all training classes at least six weeks prior to the first class. The Engineer may modify any or all of the training course outline and training materials to meet the needs of the Owner. Review and approval by the Engineer shall be completed at least three weeks prior to the first class.

1.11 WARRANTY

A. Warrant all work as follows:

1. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during normal business hours.

2. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a separate warranty start date and period.

3. At the end of the final start-up, testing, and commissioning phase, if equipment and systems are operating satisfactorily to the Engineer, the Engineer shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of acceptance shall be the start of warranty.

4. Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software deficiencies as identified by the Contractor shall be provided at no charge during the warranty period. Any upgrades or functional enhancements associated with the above mentioned items also can be provided during the warranty period for an additional charge to the Owner by purchasing an in-warranty service agreement from the Contractor. Written authorization by the Owner must, however, be granted prior to the installation of any of the above mentioned items.

5. Exception: The Contractor shall not be required to warrant reused devices, except for those that have been rebuilt and/or repaired. The Contractor shall warrant all installation labor and materials, however, and shall demonstrate that all reused devices are in operable condition at the time of Engineer's acceptance.

1.12 OWNERSHIP OF PROPRIETARY MATERIAL

A. All project-developed software and documentation shall become the property of the Owner. These include, but are not limited to:

1. Project graphic images
2. Record drawings
3. Project database
4. Project-specific application programming code
5. All documentation

PART 2: PRODUCTS

2.0 SECTION INCLUDES

.1 Materials
.2 Communication
.3 Operator Interface
.4 Controller Software
.5 Building Controllers
.6 Custom Application Controllers
.7 Application Specific Controllers
.8 Input/ Output Interface
.9 Power Supplies and Line Filtering
.10 Auxiliary Control Devices
.11 Wiring and Raceways
.12 Fiber Optic Cable System

2.1 MATERIALS

A. All products used in this project installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of two years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's Representative in writing. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATION

A. All control products provided for this project shall comprise a BACnet internetwork. Communication involving control components (i.e., all types of controllers and operator interfaces) shall conform to ANSI/ASHRAE Standard 135-1995, BACnet.

B. Each BACnet device shall operate on the BACnet Data Link/Physical layer protocol specified for that device as defined in this section.

C. The Contractor shall provide all communication media, connectors, repeaters, bridges, hubs, and routers necessary for the internetwork.

D. All controllers shall have a communication port for connections with the operator interfaces using the BACnet Data Link/ Physical layer protocol.

E. A device on the internetwork shall be provided with a 28,800-baud modem that will allow for remote operator interface using the BACnet PTP Data Link/ Physical layer protocol. Remote operator interface via this modem shall allow for communication with any and all controllers on this network as described in Paragraph F below.

F. Communication services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:

1. Connection of an operator interface device to any one controller on the internetwork will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the internetwork.

2. All database values (e.g., objects, software variables, custom program variables) of any one controller shall be readable by any other controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to a object name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communication services to perform internetwork value passing.

G. The time clocks in all controllers shall be automatically synchronized daily via the internetwork. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the internetwork.

H. The internetwork shall have the following minimum capacity for future expansion:

1. Each Building Controller shall have routing capacity for 150 controllers.

2. The Building Controller network shall have capacity for 1000 Building Controllers.

3. The system shall have an overall capacity for 12,500 Building Controller, Custom Application Controller, and Application Specific Controller input/output objects.

2.3 OPERATOR INTERFACE (EXISTING Delta Controls OWS)

2.4 CONTROLLER SOFTWARE

A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation.

B. System Security

1. User access shall be secured using individual security passwords and user names.

2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.

3. User Log On/Log Off attempts shall be recorded.

4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.

C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:

1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.

2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.

3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.

D. System Coordination. Provide a standard application for the proper coordination of equipment. This application shall provide the operator with a method of grouping together equipment based on function and location. This group may then be used for scheduling and other applications.

E. Binary Alarms. Each binary object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.

F. Analog Alarms. Each analog object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.

G. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and other conditions. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display graphics.

H. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet Point-To-Point at a minimum of 28,800 baud. Receivers shall be BACnet workstations.

I. Demand Limiting.

1. The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines.

2. The demand-limiting program shall predict the probable power demand such that action can be taken to prevent exceeding the demand limit. When demand prediction exceeds demand limit, action will be taken to reduce loads in a predetermined manner. When demand prediction indicates the demand limit will not be exceeded, action will be taken to restore loads in a predetermined manner.

3. Demand reduction shall be accomplished by the following means:
   a. Reset air handling unit supply temperature setpoint up by 1°C [2°F].
   b. Reset space temperature setpoints up by 1°C [2°F].
   c. De-energize equipment based upon priority.

4. Demand limiting parameters, frequency of calculations, time intervals, and other relevant variables shall be based on the means by which the local power company computes demand charges.

5. Provide demand-limiting prediction and control for any individual meter monitored by the system or for the total of any combination of meters.

6. Provide the means for an operator to make the following changes on-line:
   a. Addition and deletion of loads controlled.
   b. Changes in demand intervals.
   c. Changes in demand limit for meter(s).
   d. Maximum shutoff time for equipment.
   e. Minimum shutoff time for equipment.
   f. Select rotational or sequential shedding and restoring.
   g. Shed/restore priority.

7. Provide the following information and reports, to be available on an hourly, daily, and monthly basis:
   a. Total electric consumption.
   b. Peak demand.
   c. Date and time of peak demand.
   d. Daily peak demand.

J. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.

6. The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

   a. Assume a predetermined failure mode.

   b. Generate an alarm notification.

7. The Building Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95.

Building Controller BACnet Services	*Initiate*	Execute
Acknowledge Alarms	–	x
Confirmed COV Notification	x	x
Confirmed Event Notification	x	x
Get Alarm Summary	x	x
Get Enrollment Summary	x	x
Subscribe COV	x	x
Unconfirmed COV Notification	x	x
Unconfirmed Event Notification	x	x
Atomic Read File	–	x
Atomic Write File	–	x
Add List Element	–	x
Remove List Element	–	x
Create Object	–	x
Delete Object	–	x
Read Property	x	x
Read Property Multiple	x	x
Write Property	x	x
Read Range	–	x
Write Property Multiple	x	x
Device Communication Control	–	x
Confirmed Private Transfer	x	x
Unconfirmed Private Transfer	x	x
Reinitialize Device	–	x
Time Synchronization	x	x
Who-Has	–	x
I-Have	x	x
Who-Is	x	x
I-Am	x	x

8. BACnet Functional Groups. The Building Controller shall support the following BACnet functional groups: Clock, Event Initiation, COV Event Response, Files, Device Communication, Time Master and Router.

B. Communication.

1. Each Building Controller shall support a communications card. The communications card shall be connected to the Building Controller by an industry stackable PC-104 bus connection. The communications card is connected to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/ Physical layer protocol. The communications card shall provide for three diverse Ethernet installations; 10Base2, 10BASE5 and 10BaseT connections.

2. Each Building Controller with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers.

3. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol P-T-P for connection to a hand-held workstation/or printer and/or modem.

4. The Building Controller secondary communication network shall support one LonWorks FTT port at 78 Kbits/s.

5. The Building Controller shall support non-proprietary open protocols, e.g. Modbus, CAB, etc. Interface to the Building Controller shall be through an EIA 232 Point-To-Point connection.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field- removable, modular terminal strips — or to a termination card connected by a ribbon cable.

E. Memory. The Building Controller shall have as a minimum standard SRAM of 256 KB, standard DRAM of 1MB and standard non-volatile 1 MB of flash memory in lieu of EPROM. Memory shall be user extendible through RAM chip sockets and SIMMs for future memory expansion.

F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours. Operation shall be

protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

G. Inputs/Outputs. Controller shall support a directly connected input/output board with 16 universal inputs and 16 universal outputs. Input/output board to be expandable through individual I/O modules and up to 3 I/O expansion boards. A fully expanded controller shall support up to 145 connected inputs/outputs.

1. Inputs. Controller input/output board shall support dry contact, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution shall be 12-bit A to D.

2. Ouputs. Controller input/output board shall support plug-and-play I/O modules configured with manual-auto-off override switch, potentiometer and input channel for feedback status or and unrelated analog or digital input. Output supported shall be 0-10 VDC-voltage and/or 4-20mA-current.

3. Diagnostics. Controller input/output board shall have red LEDs providing input status indication.

4. External Power. Controller input/ouput board shall have four on-board 24 VDC terminal for directly connected active transducers.

5. The Building Controller shall have the capability to create, delete and support the following BACnet Objects:

a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; COV Increment; Out of Service and Units. In addition, these objects shall support the properties: Device type; Reliability; Min./Max. Values; Update Interval and Resolution.

b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Desription; Polarity; Default Value; Min On/Off and Out of Service. In addition, these objects shall support the properties: Device Type; Reliability; Active/Inactive Texts; Update Interval; Resolution; Change-of-State Time; Count Times and Time Reset.

c. CALENDAR: This object shall have the following writeable properties: Object Name; Object Value; Description; and Date List.

d. DEVICE: This object shall have the following writeable properties: Object Name; Description; Location; and UTC Offset.

e. EVENT ENROLMENT: This object shall have the following writeable properties: Object Name; Object Value; Description;Out-of-Service; Event & Notify Types; Paramenters; Property Ref; Enable; and Notification Class.

f. FILE: This object shall have the following writeable properties: Object Name; Description; File Type; and File Access.

g. LOOP (PID): This object shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Output and Input Refs.; Input Value & Units; Setpoint Value; PID Values; Bias; Write Priority and COV Increment. In addition, this object shall support the properties: Reliablity; Update Interval; Proportional Constant & Units; Derviative Constant & Units and Min./Max. Outputs.

h. NOTIFICATION CLASS: This object shall have the following writeable properties: Object Name; Object Value; Description; Priority and Ack Requried.

i. PROGRAM: This object shall have the following writeable properties: Object Name; Object Value and Description. In addition, this object shall support the property Reliablity.

j. SCHEDULE: This object shall have the following writeable properties: Object Name; Object Value and Description; Effective period; Schedule; Exception; Controlled Properties and Write Properties.

k. TREND LOG: This object shall have the following writeable properties: Object Name; Description; Log Enable; Start/stop Times; Log Device Object Property; Log Interval; Stop When Full; Buffer Size; and Record Count.

2.6 Custom Application Controllers

A. General. Provide an adequate number of Custom Application Controllers to acchieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.

1. The Custom Application Controller shall have sufficient memory to support its operating system, database, and programming requirements.

2. Data shall be shared between networked Custom Application Controllers.

3. The operating system of the Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.

4. Controllers that perform scheduling shall have a real-time clock.

5. The Custom Application Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

   a. Assume a predetermined failure mode.

   b. Generate an alarm notification.

6. The Custom Application Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95.

B. Communication.

1. Each Custom Application Controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.

2. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol for connection to a hand-held workstation.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F].

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.

E. Memory. The Custom Application Controller shall be non-volatile FLASH memory.

F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

2.7 APPLICATION SPECIFIC CONTROLLERS

A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user-programmable, but are customized for operation within the confines of the equipment they are designed to serve. Application Specific Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of ASHRAE Standard 135-95.

1. Each ASC shall be capable of standalone operation and shall continue to provide control functions without being connected to the network.

2. Each ASC will contain sufficient I/O capacity to control the target system.

B. Communication.

1. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol. Each ASC shall be connected to one Building Controller. Each Building Controller shall support a network of 150 ASCs. Each ASC shall be optically isolated from the network.

2. Each controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.

C. Environment. The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C [-40°F to 150°F].

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.

E. Memory. The Application Specific Controller shall use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.

F. Immunity to power and noise. ASC shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

H. Input/Output. ASC shall support as a minimum, directly connected, four analog or digial inputs and two analog outputs and five digital outputs. ASC inputs shall support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs shall support 0-10 VDC-voltage, 4-20 mA-current and digital triac rated at 0.5 amps at 24 VAC.

I. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.8 INPUT/OUTPUT INTERFACE

A. Hardwired inputs and output points/objects may be wired into the system through Building, Custom Application, or Application Specific Controllers.

B. All input and output points shall be protected such that shorting of the point to itself, to another point, or to ground, will cause no damage tot he controller. All input and output points shall be protected from voltage up to 24 volts of any duration, such tat contact with this voltage will cause no damage to the controller. Inputs and outputs shall be arranged on interchangeable modules or circuit boards to allow the replacement of a damaged module or board without replacing the entire controller.

C. Digital inputs shall allow the monitoring of ON/OFF signals from remote devices. The digital inputs shall provide a current of at least 12 mA to be compatible with commonly available control devices, and shall be protected against the effects of contact bounce and noise. Digital inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.

D. Pulse accumulation inputs. This type of point/object shall conform to all requirements of a binary input point/object, and also accept up to 10 pulses per second for pulse accumulation.

E. Analog inputs shall allow the monitoring of 0-5 VDC, 0-10 VDC-voltage, 4-20 mA-current, or thermistors, RTD-resistance signals. Analog inputs shall be compatible, and be field configurable to commonly available sensing devices.

F. Digital outputs shall provide for ON/OFF operation, or a pulsed low-voltage signal for pulse width modulation control. Digital outputs on Building and Custom Application Controllers shall have three-position override switches, Hand-Off-Auto with status lights. Outputs shall be selectable for either normally open or normally closed operation.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on Building or Custom Application Controllers shall have status lights and a two-position (AUTO/MANUAL) switch and manually adjustable potentiometer for manual override. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

H. Tri-State Outputs. Provide tri-state outputs (two coordinated binary outputs) for control of three-point floating type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct mounted heating coils, zone dampers, radiation, etc.). Control algorithms shall run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

I. Input/Output points/objects shall be universal type, i.e., controller input or output may be designated (in software) as either a binary or analog type point/object with appropriate properties. Application Specific Controllers are exempted from this requirement.

J. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.9 POWER SUPPLIES AND LINE FILTERING

A. Control transformers shall be UL Listed. Furnish Class 2 current-limiting type, or furnish over-current protection in both primary and secondary circuits for Class 2 service per NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100 microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection, and shall be able to withstand a 150% current overload for at least 3 seconds without trip-out or failure.

a. Unit shall operate between 0°C and 50°C [32°F and 120°F]. EM/RF shall meet FCC Class B and VDE 0871 for Class B, and MIL-STD 810C for shock and vibration.

b. Line voltage units shall be UL Recognized and CSA Approved.

B. Power line filtering.

1. Provide transient voltage and surge suppression for all workstations and controllers either internally or as an external component. Surge protection shall have the following at a minimum:

a. dielectric strength of 1,000 volts minimum
b. response time of 10 nanoseconds or less
c. transverse mode noise attenuation of 65 dB or greater
d. common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz.

2.10 AUXILIARY CONTROL DEVICES

A. Motorized control dampers, unless otherwise specified elsewhere, shall be as follows:

1. Control dampers shall be parallel or opposed blade type as below or as scheduled on drawings.

a. Outdoor and/or return air mixing dampers and face and bypass (F&BP) dampers shall be parallel blade, arranged to direct air-streams toward each other.
b. Other modulating dampers shall be opposed blade type.

c. Two-position shutoff dampers may be parallel or opposed blade type with blade and side seals.

2. Damper frames shall be 13 gauge galvanized steel channel or 1/8" extruded aluminium with reinforced corner bracing.

3. Damper blades shall not exceed 20 cm [8"] in width or 125 cm [48"] in length. Blades are to be suitable for medium velocity performance (10 m/s [2,000 fpm]). Blades shall be not less than 16 gauge.

4. Damper shaft bearings shall be as recommended by manufacturer for application, Oilite or better.

5. All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of

50 L/s·m² [10 cfm per sq. ft.] at 1000 Pa [4" w.c.] differential pressure. Provide air foil blades suitable for a wide-open face velocity of 7.5 m/s [1,500 fpm].

6. Individual damper sections shall not be larger than 125 cm x 150 cm [48" x 60"]. Provide a minimum of one damper actuator per section.

7. Modulating dampers shall provide a linear flow characteristic where possible.

8. Dampers shall have exposed linkages.

B. Electric damper/valve actuators.

1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

2. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.

3. All rotary spring-return actuators shall be capable of both clockwise or counter-clockwise spring-return operation. Linear actuators shall spring-return to the retracted position.

4. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.

5. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications. Actuators operating on 120 VAC or 230 VAC shall not require more than 11 VA.

6. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 N·m [60 in-lb] torque capacity shall have a manual crank for this purpose.

7. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.

8. Actuators shall be provided with a raceway fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

9. Actuators shall be UL Standard 873 Listed and CSA Class 4813 02 Certified as meeting correct safety requirements and recognized industry standards.

10. Actuators shall be designed for a minimum of 60,000 full-stroke cycles at the actuator's rated torque.

C. Control valves.

1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.

2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

a. Water Valves:
1. Two-way: 150% of total system (pump) head.
2. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

b. Steam Valves: 150% of operating (inlet) pressure.

3. Water Valves:

a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.

b. Sizing Criteria:

1. Two-position service: Line size.

2. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.

3. Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 35 kPa [5 psi] maximum.

4. Valves ½" through 2" shall be bronze body or cast brass ANSI Class 250, spring-loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.

5. 2½" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.

c. Water valves shall fail normally open or closed as scheduled on plans, or as follows:

1. Water zone valves - normally open preferred.
2. Heating coils in air handlers - normally open.
3. Chilled water control valves - normally closed.
4. Other applications - as scheduled or as required by sequences of operation.

D. Binary Temperature Devices

1. Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C to 30°C [55°F to 85°F] setpoint range, 1°C [2°F] maximum differential, and vented ABS plastic cover.

2. Line-voltage space thermostat shall be bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, concealed setpoint adjustment, 13°C to 30°C [55°F to 85°F] setpoint range, 1°C [2°F] maximum differential, and vented ABS plastic cover.

3. Low-limit thermostats. Low-limit thermostats shall be vapor pressure type with an element 6 m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any 30 cm [1 ft] section. The low-limit thermostat shall be manual reset only.

F. Temperature sensors.

1. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistors.

2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5 m [5 feet] in length.

3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

4. Space sensors shall be equipped with setpoint adjustment, override switch, display, and/or communication port as shown.

5. Provide matched temperature sensors for differential temperature measurement.

G. Humidity sensors.

1. Duct and room sensors shall have a sensing range of 20% to 80%.

2. Duct sensors shall be provided with a sampling chamber.

3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].

4. Humidity sensor's drift shall not exceed 1% of full scale per year.

H. Flow switches.

1. Flow-proving switches shall be either paddle or differential pressure type, as shown.

2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.

3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as specified.

I. Relays.

1. Control relays shall be UL Listed plug-in type with dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage suitable for application.

2. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from setpoint shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

J. Override timers.

1. Override timers shall be spring-wound line voltage UL Listed, contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless otherwise specified; suitable for flush mounting on control panel face, located on local control panels or where shown.

K. Current transmitters.

1. AC current transmitters shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A,

and 200 A full scale, internal zero and span adjustment, and ±1% full scale accuracy at 500 ohm maximum burden.

2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

3. Unit shall be split-core type for clamp-on installation on existing wiring.

L. Current transformers.

1. AC current transformers shall be UL/CSA recognized and completely encased (except for terminals) in approved plastic material.

2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full scale output.

3. Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.

M. Voltage transmitters.

1. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.

2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with ±1% full-scale accuracy with 500 ohm maximum burden.

3. Transmitters shall be UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

N. Voltage transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 VAC rated, complete with built-in fuse protection.

2. Transformers shall be suitable for ambient temperatures of 4 to 55°C [40 to 130°F] and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.

3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

O. Power monitors.

1. Power monitors shall be three-phase type furnished with three-phase disconnect/shorting switch assembly, UL Listed voltage transformers and UL Listed split-core current transformers.

2. Shall provide a selectable rate pulse output for kWh reading and a 4 to 20 mA output for kW reading. Shall operate with 5 A current inputs with a maximum error of ±2% at 1.0 power factor or ±2.5% at 0.5 power factor.

P. Current switches.

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

Q. Pressure transducers.

1. Transducer shall have linear output signal. Zero and span shall be field-adjustable.

2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.

4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and maximum static pressure shall be 300 psi. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and five-valve manifold.

R. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as shown.

S. Local control panels.

1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with [hinged door], key-lock latch, removable sub-panels. A single key shall be common to all field panels and sub-panels.

2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

3. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

2.11 WIRING AND RACEWAYS

A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16.

B. All insulated wire to be copper conductors, UL labeled for 90C minimum service.

2.12 FIBER OPTIC CABLE SYSTEM

A. Optical cable: Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. The sheath shall be UL Listed OFNP in accordance with NEC Article 770. The optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.

B. Connectors: All optical fibers shall be field-terminated with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3: EXECUTION

3.0 SECTION INCLUDES

1. Examination
2. Protection
3. Coordination
4. General Workmanship
5. Field Quality Control
6. Existing Equipment
7. Wiring
8. Communication Wiring
9. Fiber Optic Cable
10. Installation of Sensors
11. Flow Switch Installation
12. Actuators
13. Warning Labels
14. Identification of Hardware and Wiring
15. Controllers
16. Programming
17. Control System Checkout and Testing
18. Control System Demonstration and Acceptance
19. Cleaning
21. Training
21. Sequences of Operation

22. Point List (Object List)

3.1 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.

C. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate — or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others — the Contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by — and at the expense of — this Contractor.

3.2 PROTECTION

A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 COORDINATION

A. Site

1. Where the mechanical work will be installed in close proximity to, or will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If the Contractor installs its work before coordinating with other trades, so as to cause any interference with work of other trades, the Contractor shall make the necessary changes in its work to correct the condition without extra charge.

2. Coordinate and schedule work with all other work in the same area, or with work which is dependent upon other work, to facilitate mutual progress.

B. Submittals. Refer to the "Submittals" Article in Part 1 of this specification for requirements.

C. Test and Balance

1. The Contractor shall furnish all tools necessary to interface to the control system for test and balance purposes.

2. The Contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.

3. In addition, the Contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.

4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.

D. Life Safety

1. Duct smoke detectors required for air handler shutdown are supplied under Division 16. The Contractor shall interlock smoke detectors to air handlers for shutdown as described in Part 3: "Sequences of Operation".

2. Smoke dampers and actuators required for duct smoke isolation are provided under another Division 15 Section. The Contractor shall interlock these dampers to the air handlers as described in Part 3: "Sequences of Operation".

3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Division 15 Section. Control of these dampers shall be by Division 16. The Contractor shall provide control air to the dampers.

E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the Contractor as follows:

1. All communication media and equipment shall be provided as specified in Part 2: "Communication" of this specification.

2. Each supplier of controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.

3. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other sections or divisions of this specification.

4. The Contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.

5. The Contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).

D. All wiring shall be verified for its integrity to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

C. Contractor shall have work inspected by local and/or state authorities having jurisdiction over the work.

3.6 EXISTING EQUIPMENT

A. Wiring: {The contractor may reuse any abandoned wires. The integrity of the wire and its proper application to the installation is the responsibility of the Contractor. The wire shall be properly identified and tested as per this specification. Unused or

redundant wiring must be properly identified as such.} {Interconnecting control wiring shall be removed and become the property of the Contractor, unless specifically noted or shown to be reused.

B. Local Control Panels: {The Contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment, or replaced with new.} {Remove and deliver to Owner.} {Existing panels become the property of the Contractor.} {Salvage, recondition, and reuse existing devices and cabinets as noted.} {Relocate as shown.}

C. Unless otherwise directed, the Contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the Contractor find existing equipment which requires maintenance, the Engineer is to be notified immediately.

D. Temperature Sensor Wells: The Contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors.

E. Indicator Gauges: Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.

F. Room Thermostats:

G. Electronic Sensors and Transmitters: Unless specifically noted otherwise, {remove and deliver to the Owner}

H. Controllers and Auxiliary Electronic Devices:

A. Damper Actuators, Linkages and Appurtenances

J. Control Valves:

K. The mechanical system must remain in operation between the hours of 6 a.m. and 6 p.m., Monday through Friday. No modifications to the system shall cause the mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort condition during any such period. Perform cutover of controls that cannot meet these conditions outside of those hours.

L. The scheduling of fans through existing or temporary time-clocks or control system shall be maintained throughout the DDC system installation.

M. Install control panels where shown.

N. Modify existing starter control circuits, if necessary, to provide Hand/Off/Auto control of each starter controlled. If new starters or starter control packages are required, these shall be included as part of this contract.

O. Patch holes and finish to match existing.

3.7 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.

B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway per NEC and Division 16 requirements.

C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations including ceiling return air plenum, approved cables not in raceway may be used, provided that cables are UL Listed for the intended application. For example, cables used in ceiling plenum shall be UL Listed specifically for that purpose.

E. All wiring in mechanical, electrical, or service rooms — or where subject to mechanical damage — shall be installed in raceway at levels below 3m [10ft].

F. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

G. Do not install wiring in raceway containing tubing.

H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and *neatly* tied at 3m [10ft] intervals.

I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.

K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

3.10 INSTALLATION OF SENSORS

A. Install all sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequately for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across duct. Each bend shall be supported with a capillary clip.

F. Low limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m^2 [1 ft of sensing element for each 1 ft^2] of coil area.

G. All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

I. Differential air static pressure.

1. Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable), or to the location of the duct high-pressure tap and leave open to the plenum.

2. Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.

3. Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.

4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.

5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.

6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.

3.11 FLOW SWITCH INSTALLATION

A. Use correct paddle for pipe diameter.

B. Adjust flow switch in accordance with manufacturer's instructions.

3.12 ACTUATORS

A. Mount and link control damper actuators per manufacturer's instructions.

1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

3. Provide all mounting hardware and linkages for actuator installation.

B. Electric/Electronic

1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations.

2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.13 WARNING LABELS

A. Permanent warning labels shall be affixed to all equipment which can be automatically started by the DDC system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows:

CAUTION
This equipment is operating under automatic control
and may start or stop at any time without warning.
Switch disconnect to "Off" position before servicing.

B. Permanent warning labels shall be affixed to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows:

CAUTION
This equipment is fed from more than one
power source with separate disconnects.
Disconnect all power sources before servicing.

3.14 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels, shall be labelled at each end within 5 cm [2"] of termination with the DDC address or termination number.

B. All pneumatic tubing shall be labelled at each end within 5 cm [2"] of termination with a descriptive identifier.

C. Permanently label or code each point/object of field terminal strips to show the instrument or item served.

D. Identify control panels with minimum 1 cm [½"] letters on laminated plastic nameplates.

E. Identify all other control components with permanent labels. All plug-in components shall be labelled such that removal of the component does not remove the label.

F. Identify room sensors relating to terminal box or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels to be visible and legible after equipment is installed.

H. Identifiers shall match record documents.

3.15 CONTROLLERS

A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points/objects associated with the system are assigned to the same DDC controller. Points/objects used for control loop reset such as outside air or space temperature are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point/object capacity for each point/object type found at each location. If input /objects are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point/object used.

1. Future use of spare capacity shall require providing the field device, field wiring, point/object database definition, and custom software. No additional controller boards or point/object modules shall be required to implement use of these spare points

3.16 PROGRAMMING

A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.

B. Point/object Naming: System point/object names shall be modular in design, allowing easy operator interface without the use of a written point/object index. Use the following naming convention:

AAABBBCCCDDDEEE where:

AAA is used to designate the location of the point/object within the building such as mechanical room, wing, or level, or the building itself in a multi-building environment.

BBB is used to designate the mechanical system with which the point/object is associated (e.g., A01, HTG, CLG, LTG).

CCC represents the equipment or material referenced (e.g., SAF for supply air fan , EXF for exhaust fan, RAF for return air fan).

D or *DD* or *DDD* may be used for clarification or for identification if more than one of CCC exists (e.g., SAF10, EXF121).

EE represents the action or state of the equipment or medium (e.g., T for temperature, RH for humidity, CO for control, S for status, D for damper control, I for current).

C. Software Programming

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the Contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

   a. Text-based:
      1. must provide actions for all possible situations
      2. must be modular and structured
      3. must be commented

   b. Graphic-based:
      1. must provide actions for all possible situations
      2. must be documented

   c. Parameter-based:
      1. must provide actions for all possible situations
      2. must be documented

D. Operator Interface

1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point/object information on the graphic displays shall dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as setpoints.

2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point/object shown.

3. The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.17 CONTROL SYSTEM CHECKOUT AND TESTING

A. Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of the system demonstration.

1. The Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.

2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations.

4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.

5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel.

6. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum Start/Stop routines.

7. Alarms and Interlocks:

   a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.

   b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.

   c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.18 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests.

2. The tests described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process and as specified in the "Control System Checkout and Testing" Article in Part 3 of this specification. The Engineer will be present to observe and review these tests. The Engineer shall be notified at least 10 days in advance of the start of the testing procedures.

3. The demonstration process shall follow that approved in Part 1: "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.

4. The Contractor shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.

5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.

6. Demonstrate compliance with Part 1: "System Performance."

7. Demonstrate compliance with Sequences of Operation through all modes of operation.

8. Demonstrate complete operation of Operator Interface.

9. Additionally, the following items shall be demonstrated:

    a. DDC Loop Response. The Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

b. Demand limiting. The Contractor shall supply a trend data output showing the action of the demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting setpoint, and the status of sheddable equipment outputs.

c. Optimum Start/Stop. The Contractor shall supply a trend data output showing the capability of the algorithm. The hour-by-hour trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

d. Interface to the building fire alarm system.

e. Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the Architect/Engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance

1. All tests described in this specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of Completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.

2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1: "Submittals."

3.19 CLEANING

A. The Contractor shall clean up all debris resulting from its activities daily. The Contractor shall remove all cartons, containers, crates, etc., under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the Contractor shall clean all of its work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.20 TRAINING

A. Provide a minimum of four on-site or classroom training sessions, three days each, throughout the contract period for personnel designated by the Owner.

B. Provide two additional training sessions at 6 and 12 months following building's turnover. Each session shall be three days in length and must be coordinated with the building Owner.

C. Train the designated staff of Owner's Representative and Owner to enable them to:

Day-to-day Operators:

1. Proficiently operate the system
2. Understand control system architecture and configuration
3. Understand DDC system components
4. Understand system operation, including DDC system control and optimizing routines (algorithms)
5. Operate the workstation and peripherals
6. Log on and off the system
7. Access graphics, point/object reports, and logs
8. Adjust and change system setpoints, time schedules, and holiday schedules
9. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
10. Understand system drawings, and Operation and Maintenance manual
11. Understand the job layout and location of control components
12. Access data from DDC controllers and ASCs
13. Operate portable operator's terminals

Advanced Operators:

14. Make and change graphics on the workstation
15. Create, delete, and modify alarms, including annunciation and routing of these
16. Create, delete, and modify point/object trend logs, and graph or print these both on an ad-hoc basis and at user-definable time intervals
17. Create, delete, and modify reports
18. Add, remove, and modify system's physical points/objects
19. Create, modify, and delete programming
20. Add panels when required
21. Add operator interface stations
22. Create, delete, and modify system displays — both graphical and otherwise

23. Perform DDC system field checkout procedures
24. Perform DDC controller unit operation and maintenance procedures
25. Perform workstation and peripheral operation and maintenance procedures
26. Perform DDC system diagnostic procedures
27. Configure hardware including PC boards, switches, communication, and I/O points/objects
28. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
29. Adjust, calibrate, and replace system components

System Managers/Administrators:

30. Maintain software and prepare backups
31. Interface with job-specific, third-party operator software
32. Add new users and understand password security procedures

D. These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required:

1. Day-to-day Operators: parts 1-13
2. Advanced Operators: parts 1-29
3. System Managers/Administrators: parts 1-13, and 30-32

E. Provide course outline and materials as per "Submittals" Article in Part 1 of this specification. The instructor(s) shall provide one copy of training material per student.

F. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

G. Classroom training shall be done using a network of working controllers representative of the installed hardware.

3.21 SEQUENCES OF OPERATION – Detailed in section 15940

3.22 POINTS LISTS:

A. BASE BID: See Appendix A (at end of Section).

B. ADD ALTERNATE #3: See Appendix A (at end of Section).

3.23 **INSTRUCTIONS TO OTHER CONTRACTORS**

A. CONTROL VALVE INSTALLATION

1. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.

2. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.

3. Valves shall be installed in accordance with the manufacturer's recommendations.

4. Control valves shall be installed so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.

5. Isolation valves shall be installed such that the control valve body may be serviced without draining the supply/return side piping system. *{Note to designer: this must also be shown.}* Unions shall be installed at all connections to screw-type control valves.

6. Provide tags for all control valves indicating service and number. Tags shall be brass, 1.5" in diameter, with ¼ " high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

B. CONTROL DAMPER INSTALLATION

1. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.

2. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure ¼ " larger than damper dimensions and shall be square, straight, and level.

3. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm [1/8"] of each other.

4. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.

5. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)

6. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.

7. Provide a visible and accessible indication of damper position on the drive shaft end.

8. Support ductwork in area of damper when required to prevent sagging due to damper weight.

9. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

C. SMOKE DAMPER INSTALLATION

1. The Contractor shall coordinate all smoke and smoke/fire damper installation, wiring and checkout to assure that these dampers function properly, and that they respond to the proper fire alarm system general, zone, and/or detector trips. The Contractor shall immediately report any discrepancies to the Engineer no less than two weeks prior to inspection by the code authority having jurisdiction.

2. Provide complete submittal data to Controls System Subcontractor for coordination of duct smoke detector interface to HVAC systems.

D. DUCT SMOKE DETECTION

1. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1: "Submittals."

2. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.

3. This Contractor shall interlock wire duct smoke detector for fan/system shutdown.

E. CONTROLS COMMUNICATION PROTOCOL

1. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points/object list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ASHRAE Standard 135-1995 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read

(Execute) Property service as defined in Clause 15.5 of ASHRAE Standard 135-95.

2. Distributed Processing. The Controller shall be capable of standalone operation and shall continue to provide control functions without being connected to the network.

3. I/O Capacity. The Controller shall contain sufficient I/O capacity to control and monitor the target system with a minimum of 16 universal inputs and 16 universal outputs.

4. Communication. The Controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol. Each network of controllers shall be connected to one Building Controller.

5. The Controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool.

6. Environment. The hardware shall be suitable for the anticipated ambient conditions.

7. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C [-40°F to 150°F].

8. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

9. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.

10. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

11. Immunity to Power and Noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

12. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

13. Protocol Implementation Conformance Statement (PICS). Supplier of the electronic controls packaged with this equipment shall provide to the controls contractor a PICS list, complete with object list and wiring diagrams for proper and complete interface.

F. STARTUP AND CHECKOUT PROCEDURES

1. Start up, check out, and test all hardware and software, and verify communication between all components.

   a. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

   b. Verify that all analog and binary input/output points/objects read properly.

   c. Verify alarms and interlocks.

   d. Verify operation of the integrated system.

END OF SECTION 15926

APPENDIX A – SECTION 15926

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
Outside Air Temperature	X							X		X	
Outside Relative Humidity	X							X		X	
Chilled Water System											
ACCH-1 Start/Stop					X		X	X	X	X	
ACCH-1 CHW Setpoint		X			X			X		X	
ACCH-1 CHW LVG Temperature	X						X	X		X	
ACCH-1 CHW ENT Temperature	X						X	X		X	
ACCH-1 2-POS Isolation Valve					X		X			X	
ACCH-1 Status	X							X		X	
ACCH-1 Chiller Alarm				X			X			X	
ACCH-2 Start/Stop					X		X	X	X	X	
ACCH-2 CHW Setpoint		X			X			X		X	
ACCH-2 CHW LVG Temperature	X						X	X		X	
ACCH-2 CHW ENT Temperature	X						X	X		X	
ACCH-2 2-POS Isolation Valve					X		X			X	
ACCH-2 Status	X							X		X	
ACCH-2 Chiller Alarm				X			X			X	
ACCH-3 Start/Stop					X		X	X	X	X	
ACCH-3 CHW Setpoint		X			X			X		X	
ACCH-3 CHW LVG Temperature	X						X	X		X	
ACCH-3 CHW ENT Temperature	X						X	X		X	
ACCH-3 2-POS Isolation Valve					X		X			X	
ACCH-3 Status	X							X		X	
ACCH-3 Chiller Alarm				X			X			X	
ACCH-4 Start/Stop [Add Alt #4]					X		X	X	X	X	
ACCH-4 CHW Setpoint		X			X			X		X	
ACCH-4 CHW LVG Temperature	X						X	X		X	
ACCH-4 CHW ENT Temperature	X						X	X		X	
ACCH-4 2-POS Isolation Valve					X		X			X	
ACCH-4 Status	X							X		X	
ACCH-4 Chiller Alarm				X			X			X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
Chilled Water Pumps											
P-3 Start/Stop					X		X	X		X	
P-3 Status	X							X		X	
P-3 VFD Speed		X						X		X	
P-4 Start/Stop					X		X	X		X	
P-4 Status	X							X		X	
P-4 VFD Speed		X						X		X	
P-5 Start/Stop					X		X	X		X	
P-5 Status	X							X		X	
P-6 Start/Stop					X		X	X		X	
P-6 Status	X							X		X	
P-9 Start/Stop [Add Alt #4]					X		X	X		X	
P-9 Status	X							X		X	
P-10 Start/Stop [Add Alt #4]					X		X	X		X	
P-10 Status	X							X		X	
CHW DP XMTR	X						X	X		X	
Hot Water Heating System											
B-1 Start/Stop					X			X	X	X	
B-1 HWS Temperature	X						X	X		X	
B-1 HWR Temperature	X						X	X		X	
B-1 Fail				X			X			X	
B-2 Start/Stop					X			X		X	
B-2 HWS Temperature	X						X	X		X	
B-2 HWR Temperature	X						X	X		X	
B-2 Fail				X			X			X	
B-3 Start/Stop					X			X		X	
B-3 HWS Temperature	X						X	X		X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
B-3 HWR Temperature	X						X	X		X	
B-3 Fail				X			X			X	
B-4 Start/Stop [Add Alt #4]					X			X		X	
B-4 HWS Temperature	X						X	X		X	
B-4 HWR Temperature	X						X	X		X	
B-4 Fail				X			X			X	
Hot Water Pumps											
P-1 Start/Stop					X		X	X		X	
P-1 Status	X							X		X	
P-1 VFD Speed		X						X		X	
P-2 Start/Stop					X		X	X		X	
P-2 Status	X							X		X	
P-2 VFD Speed		X						X		X	
P-11 Start/Stop					X		X	X		X	
P-11 Status	X							X		X	
P-12 Start/Stop					X		X	X		X	
P-12 Status	X							X		X	
P-13 Start/Stop					X		X	X		X	
P-13 Status	X							X		X	
P-14 Start/Stop [Add Alt #4]					X		X	X		X	
P-14 Status	X							X		X	
Main Heating Loop Supply Temperature	X						X	X		X	
Main Heating Loop Return Temperature	X						X	X		X	
AHU-1B (Alt #7)											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
Supply Fan Start/Stop					X			X	X	X	
Supply Fan Status	X							X		X	
Supply Fan VFD Speed		X								X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Discharge %RH	X						X	X		X	
Duct Static Pressure – North	X						X	X		X	
Duct Static Pressure – South	X						X	X		X	
Return Fan Start/Stop					X			X	X	X	
Return Fan Status	X							X		X	
Return Fan VFD Speed		X								X	
Return Air Temperature	X						X	X		X	
Return %RH	X						X	X		X	
Return Air CO2 PPM	X						X	X		X	
Humdifier Start/Stop					X			X		X	
Humidifier Control		X					X	X		X	
Humidity Hi – Limit				X			X			X	
Freeze –LLT				X			X			X	
Smoke Detector				X			X			X	
Filter Status	X						X			X	
AHU-2 (Alt. #7)											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X			X	X	X	
Supply Fan Status	X							X		X	
Supply Fan VFD Speed		X						X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Discharge %RH	X						X	X		X	
Duct Static Pressure – North	X						X	X		X	
Duct Static Pressure – South	X						X	X		X	
Return Fan Start/Stop					X			X	X	X	
Return Fan Status	X							X		X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
Return Fan VFD Speed		X						X		X	
Return Air Temperature	X						X	X		X	
Return %RH	X						X	X		X	
Return Air CO2 PPM	X						X	X		X	
Humdifier Start/Stop					X			X		X	
Humidifier Control		X					X	X		X	
Humidity Hi – Limit				X			X			X	
Freeze –LLT				X			X			X	
Smoke Detector				X			X			X	
Filter Status	X						X			X	
AHU-3 (Alt. #7)											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X			X	X	X	
Supply Fan Status	X							X		X	
Supply Fan VFD Speed		X						X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Discharge %RH	X						X	X		X	
Duct Static Pressure – North	X						X	X		X	
Duct Static Pressure – South	X						X	X		X	
Return Fan Start/Stop					X			X	X	X	
Return Fan Status	X						X	X		X	
Return Fan VFD Speed		X						X		X	
Return Air Temperature	X						X	X		X	
Return %RH	X							X		X	
Return Air CO2 PPM	X						X	X		X	
Humdifier Start/Stop					X			X		X	
Humidifier Control		X					X	X		X	
Humidity Hi – Limit				X			X			X	
Freeze –LLT				X			X			X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
Smoke Detector				X			X			X	
Filter Status	X						X			X	
AHU-4 (Alt. #7)											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X			X	X	X	
Supply Fan Status	X							X		X	
Supply Fan VFD Speed		X						X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Discharge %RH	X						X	X		X	
Duct Static Pressure – North	X						X	X		X	
Duct Static Pressure – South	X						X	X		X	
Return Fan Start/Stop					X			X	X	X	
Return Fan Status	X							X		X	
Return Fan VFD Speed		X						X		X	
Return Air Temperature	X						X	X		X	
Return %RH	X							X		X	
Return Air CO2 PPM	X						X	X		X	
Humdifier Start/Stop					X			X		X	
Humidifier Control		X					X	X		X	
Humidity Hi – Limit				X			X			X	
Freeze –LLT				X			X			X	
Smoke Detector				X			X			X	
Filter Status	X						X			X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
AHU-5 (Alt. #7)											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X		X	X	X	X	
Supply Fan Status	X							X		X	
Supply Fan VFD Speed		X						X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Discharge %RH	X						X	X		X	
Duct Static Pressure – North	X						X	X		X	
Duct Static Pressure – South	X						X	X		X	
Return Fan Start/Stop					X		X	X	X	X	
Return Fan Status	X							X		X	
Return Fan VFD Speed		X						X		X	
Return Air Temperature	X						X	X		X	
Return %RH	X						X	X		X	
Return Air CO2 PPM	X						X	X		X	
Humdifier Start/Stop					X			X		X	
Humidifier Control		X					X	X		X	
Humidity Hi – Limit				X			X			X	
Freeze –LLT				X			X			X	
Smoke Detector				X			X			X	
Filter Status	X						X			X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
AHU-6A [Add Alt #4] If not then AHU-6.											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X		X	X	X	X	
Supply Fan Status	X							X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Return Air Temperature	X						X	X		X	
Exhaust Fan Start/Stop					X		X	X	X	X	
Exhaust Fan Status	X							X		X	
Exhaust Fan VFD Speed							X	X		X	
Return Air CO2 – PPM	X						X	X		X	
Freeze – LLT				X			X			X	
Filter Status	X						X	X		X	
Smoke Detector				X			X			X	
AHU-6B [Add Alt #4]											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X		X	X	X	X	
Supply Fan Status	X							X		X	
HW Control Valve		X					X	X		X	
CW Control Valve		X					X	X		X	
Discharge Air Temperature	X						X	X		X	
Return Air Temperature	X						X	X		X	
Exhaust Fan Start/Stop					X		X	X		X	
Exhaust Fan Status	X							X		X	
Exhaust Fan VFD Speed		X					X	X		X	
Return Air CO2 – PPM	X						X	X		X	
Freeze – LLT				X			X			X	
Filter Status	X							X		X	
Smoke Detector				X				X		X	

APPENDIX A (Continued)

BACnet OBJECT LIST

PROJECT: Glickman Library
University of Southern Maine

Object Name	BACnet Object Types									Graphic Display	Notes
	AI	AO	AV	BI	BO	BV	Alarm	Trend	Sched.		
AHU-6B (Continued)											
Humidity Control		X					X			X	
Humidity Discharge %RH	X						X	X		X	
Humidity Return %RH	X						X	X		X	
Humidity Hi- Limit				X			X			X	
AHU-7											
Outside Air Flow Station	X						X	X		X	
Mixing Dampers		X								X	
Mixed Air Temperature	X						X	X		X	
Supply Fan Start/Stop					X		X	X	X	X	
Supply Fan Status	X						X	X		X	
HW Control Valve		X					X			X	
CW Control Valve		X					X			X	
Discharge Air Temperature	X						X			X	
Return Air Temperature	X						X			X	
Exhaust Fan Start/Stop					X		X			X	
Exhaust Fan Status	X						X			X	
Exhaust Fan VFD Speed		X					X			X	
Return Air CO2 – PPM	X						X	X		X	
Freeze – LLT				X			X			X	
Filter Status	X							X		X	
Smoke Detector				X				X		X	
Humidity Control		X					X			X	
Humidity Discharge %RH	X						X	X		X	
Humidity Return %RH	X						X	X		X	
Humidity Hi- Limit				X			X			X	
Duct Static Pressure – North	X							X		X	
Duct static Pressure - South	X							X		X	
Variable Air Volume Boxes (Typical)											
VAV Box Air Flow - CFM	X							X		X	
VAV Box Air Damper		X								X	
VAV Space Temperature	X						X	X		X	
VAV Space %RH	X						X	X		X	

END OF APPENDIX A

SECTION 15940

HVAC SEQUENCE OF OPERATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The complete chilled water system (including all chillers) and hot water heating system (including all boilers) will be controlled by the new DDC system, including new and existing equipment. ACCH-1, ACCH-2, B-1, B-2 and B-3 are existing. The existing Honeywell controls will be removed from existing chillers and boilers and their associated pumps.

B. All new air handling systems will be controlled by the new DDC system. The existing Honeywell control system will be retained for systems AHU-1B, AHU-2, AHU-3, and AHU-4 unless Bid Alternate #3 is accepted, when the existing controls will be changed to new DDC.

C. All new controls shall be DDC.

D. OWS = Operator Work Station (the front-end PC for the DDC/BAS/EMS system).

E. DDC = Direct Digital Control.

1.02 RELATED SECTIONS

A. Section 15926 – Energy Management and Control System

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CHILLED WATER SYSTEMS

A. Chilled Water System – Main System – Normal Operation

1. ACCH-1 and ACCH-3 shall operate with local stand-alone controls, with interface to the OWS for start/stop (e.g., enable/lockout), CHW temperature reset, and motorized valve open/close.

2. Chillers shall be enabled or locked out based on a programmed schedule and/or operating strategy, with system monitoring and control from the OWS. See below for suggested strategy.

3. Chilled water setpoint shall be locally set for 45 deg F (adj.), and shall be resettable from the OWS. ACCH-1 and ACCH-3 shall be set up for supply water temperature control, NOT return water control.

4. Motorized valve for each chiller shall be automatically opened from the OWS when the chiller is enabled, and shall close when the chiller is locked out.

5. Each chiller shall have a flow switch wired to the local chiller control panel, to prove flow before starting chiller, thus preventing evaporator freeze-up. (Start/stop control may be wired in series with this flow switch.)

6. ACCH-3 shall operate as the lead chiller. When cooling load increases to the point where ACCH-3 can no longer hold setpoint within 5 deg F of desired CHW supply setpoint (i.e., when setpoint is exceeded by 3 degrees or more for at least 5 minutes), ACCH-3 shall be stopped and ACCH-4 shall be started. When water supply temperature decreases to 5 deg F below the point where ACCH-4 was started, ACCH-4 shall be stopped and ACCH-3 shall be started.

7. When their starter switches are in AUTO, CHW pumps P-3 and P-4 shall modulate (with VFDs) to maintain a remote DP setpoint of 5 PSID (adj.). (Eventually, this value can be adjusted to maximize efficiency, to obtain design system delta-T of 10-15 deg F.) At high cooling loads, both pumps may run. At low cooling loads, VFD turndown shall be limited so that evaporator flow stays above the minimum required. Pump start/stop, VFD speed and pump status shall be available at the OWS. Both pumps shall be stopped when both chillers are locked out.

B. Chilled Water System – Main System - De-Humidification Mode (Backup to ACCH-2 or ACCH-4)

1. Same as above, except manual valves are aligned as necessary to supply chilled water to AHU-1A or AHU-6A (If add alternate #4 is accepted), CHW supply temperature is manually reset to 35 deg F, and at least one chiller will run continuously.

C. Chilled Water System – 1st Floor Osher Map Library (Existing System Now Stand-Alone)

1. ACCH-2 shall operate with local stand-alone controls, with interface to the OWS for start/stop (e.g., enable/lockout) and CHW temperature reset.

2. This system shall operate continuously, with monitoring and control from the OWS.

3. Chilled water setpoint shall be local set for 35 deg F (adj.), and shall be resettable from the OWS.

4. Chiller has existing flow switch wired to local control panel to prove flow before starting

chiller, thus preventing evaporator freeze-up.

5. CHW pumps P-5 or P-6 shall operate (one running, one in standby) to provide constant flow. Pumps shall be configured for automatic changeover in the event of pump failure.

D. Chilled Water System – 6th Floor Special Collections (Add Alternate #4)

1. ACCH-4 shall operate with local stand-alone controls, with interface to the OWS for start/stop (e.g., enable/lockout) and CHW temperature reset.

2. This system shall operate continuously, with monitoring and control from the OWS.

3. Chilled water setpoint shall be locally set for 35 deg F (adj.), and shall be resettable from the OWS.

4. Chiller shall have a flow switch wired to local control panel to prove flow before starting chiller, thus preventing evaporator freeze-up.

5. CHW pumps P-9 or P-10 shall operate (one running, one in standby) to provide constant flow. Pumps shall be configured for automatic changeover in the event of pump failure. Set alarm at pump failure.

3.02 HOT WATER HEATING SYSTEM

A. Note: The existing Honeywell W7100J Discharge Water Temperature Control unit shall be removed from the system, and replaced by DDC control, programmable from the OWS.

B. Boilers B-1, B-2, B-3 (and B-4 if applicable – Add Alternate #4) shall operate with local stand-alone controls, with interface to the OWS for start/stop (e.g., enable/lockout). (For existing boilers, this start/stop signal shall replace the existing start stop signal from the Honeywell W7100J.) for each boiler, the local Operator control shall be set at 190-200 deg F, and the local High Limit control shall be set at 200 deg F.

C. Boilers shall be enabled or locked out based on a programmed schedule and/or operating strategy, with system monitoring and control from the OWS. See below for suggested strategy.

D. Each boiler shall have a dedicated injection pump (P-11, P-12 and P-13; also P-14 if applicable – Add Alternate #4) which shall be wired to start with its associated boiler, and to stop 1 minute after the boiler is turned off. Boiler injection pumps do not need to be wired to the OWS.

E. Hot water supply temperature setpoint shall be 180 deg F (adj.), controlled from the OWS. Supply temperature shall be measured by a temperature sensor downstream of the boilers. If desired, HW supply temperature may be reset based on outside air and/or schedules.

F. On decreasing temperature, when the HW supply temperature drops to 5 deg F. below setpoint, the lead boiler shall be started. If the supply temperature drops to 10 deg F below setpoint, the second boiler shall start. If the supply temperature drops to 15 deg F below setpoint, the third boiler shall start. When the HW supply temperature increases to 5 deg F above setpoint, all boilers shall stop.

G. The lead boiler shall be rotated weekly for even run time.

H. HW pumps P-1 and P-2 shall modulate (with VFD) to maintain a remote DP setpoint of 5 psid (adj.). (Note: Current setpoint is 25 psid, which seems unreasonably high.) One pump shall run with the other pump in standby. Pump start/stop and pump status shall be available from the OWS.

I. Lead pump (P-1 or P-2) shall be rotated weekly for even run time.

3.03 AIR HANDLING UNITS

A. Air Handling Unit: AHU-1A (Variable Air Volume)

1. This system was recently upgraded and will require no work under this Contract.

B. Air Handling Units: AHU-1B, 2, 3 and 4 (Variable Air Volume) - (Bid Alternate #7)

1. Air handling systems shall be operated by the DDC system, based on a programmed schedule and/or operating strategy, with monitoring and control from the OWS.

2. Time Schedule: Start and stop supply and exhaust fans through the DDC system as determined by programmed operating schedule. Determine fan status through auxiliary contactors in motor starter. If fan fails to start as commanded, signal alarm.

3. Safety Devices:
   a. Freeze Protection: Stop fans, close outside air dampers, shut down humidifiers, and set preheat coil valve to 100% open if temperature before supply fan is below 37 degrees F (3 degrees C); signal alarm. This condition must be manually reset.
   b. Smoke Detector: Stop fans, close outside air dampers, and signal alarm.

4. Occupied Mode: Occupied and unoccupied times will be determined by the DDC system. In occupied mode, supply and exhaust fans will run continuously. When supply fan starts, OA, RA and EA dampers will assume minimum position.

5. Supply Fan Speed Control: Supply fan VFD speed shall be modulated to maintain the duct static pressure setpoint of 1 in. w.g. (adj.). This setpoint shall be adjusted to the lowest practical limit which will allow for proper VAV box operation. Where an AHU feeds two main ducts (e.g., north and south), one duct static pressure sensor shall be installed in each main, and the fan shall maintain setpoint on the lower of the two.

6. Return Fan Speed Control: Return fan VFD speed shall be modulated so that return air cfm equals supply fan air cfm less exhaust.

7. Economizer Mode: The economizer mode is enabled when the outside air temperature is below 55 deg F. When the economizer mode is enabled, the cooling coil valve is shut. When the economizer mode is disabled, the mixing dampers are set to allow minimum outside air.

8. Discharge Air Temperature: Discharge air temperature sensor shall modulate mixing dampers, preheat coil valve, and cooling coil valve, in sequence, to maintain discharge air temperature. Discharge air temperature shall be maintained at 55 deg F (adj.), or may be reset with a PI or PID control loop based on return air temperature (for energy efficiency). Hot and chilled water control valves shall not be open simultaneously, and their operation shall be coordinated with economizer mode. If economizer mode is enabled, the cooling coil valve is shut and the mixing dampers and preheat coil valve modulate, without overlap, to maintain discharge air temperature. If economizer mode is disabled, the mixing dampers are set to allow minimum outside air, and the preheat coil and cooling coil valves modulate, without overlap, to maintain discharge air temperature.

9. Outside Air Dampers (and RA and EA Dampers): Outside air damper shall modulate to maintain the programmed design outside air cfm, as measured by the outside air flow station, unless overridden by an economizer routine (or by a CO2 sensor). RA and EA dampers shall modulate in concert with OA dampers to maintain air balance.

10. CO2 Sensor: A CO2 sensor mounted in the return air ductwork shall modulate the outdoor, exhaust and return air quantities to maintain a CO2 setpoint of less than 600 ppm (adj.).

11. Zone Air Flow: VAV box dampers shall modulate to maintain measured VAV box airflow at the programmed setpoint, as programmed at the OWS. Full flow shall be provided when a zone is calling for cooling, and lower flow (as noted on drawings) may be required when a zone is calling for heating.

12. Space Temperature: Space temperature sensors or thermostats shall modulate main reheat coils to maintain space setpoints of 70 – 75 deg F (adj.) during occupied mode, with night setback/setup during unoccupied mode.

13. Space RH: Return air humidity sensor shall modulate humidifier to maintain RH setpoint of 30% (adj.). Discharge air humidity sensors shall provide high-limit protection by shutting off humidifier if discharge air RH exceeds high limit setpoint.

14. Unoccupied Mode: When the unit shuts down, the supply and return fan shall stop, the OA and EA dampers shall fully close, the RA damper shall fully open, and the humidifier shall be locked out. In unoccupied mode, the space sensing the lowest temperature shall cycle the unit on, with 100% return air, and modulate the respective reheat coil valve(s) to maintain night setpoint. When outside air temperature is below 35 deg F, the preheat coil valve shall be set for constant 10% flow during unoccupied periods, to prevent nuisance tripping of freezestats.

C. Air Handling Units: AHU-5, AHU-6 (Add Alternate #4) and AHU-7 (Variable Air Volume)

1. Air handling systems shall be operated by the DDC system, based on a programmed schedule and/or operating strategy, with monitoring and control from the OWS.

2. Time Schedule: Start and stop supply and exhaust fans through the DDC system as determined by programmed operating schedule. Determine fan status through auxiliary contactors in motor starter. If fan fails to start as commanded, signal alarm.

3. Safety Devices:
   a. Freeze Protection: Stop fans, close outside air dampers, shut down humidifiers, and set preheat coil valve to 100% open if temperature before supply fan is below 37 degrees F (3 degrees C); signal alarm. This condition must be manually reset.
   b. Smoke Detector: Stop fans, close outside air dampers, and signal alarm.

4. Occupied Mode: Occupied and unoccupied times will be determined by the DDC system. In occupied mode, supply and exhaust fans will run continuously. When supply fan starts, OA, RA and EA dampers will assume minimum position.

5. Supply Fan Speed Control: Supply fan VFD speed shall be modulated to maintain the duct static pressure setpoint of 1 in. w.g. (adj.). This setpoint shall be adjusted to the lowest practical limit which will allow for proper VAV box operation. Where an AHU feeds two main ducts (e.g., north and south), one duct static pressure sensor shall be installed in each main, and the fan shall maintain setpoint on the lower of the two.

6. Exhaust Fan Speed Control: Exhaust fan VFD speed shall be modulated so that exhaust air cfm equals outside air cfm minus exhaust and pressurization, and building pressure on the fifth and seventh floors is maintained constant.

7. Economizer Mode: The economizer mode is enabled when the outside air temperature is below 55 deg F. When the economizer mode is enabled, the cooling coil valve is shut. When the economizer mode is disabled, the mixing dampers are set to allow minimum outside air.

8. Discharge Air Temperature: Discharge air temperature sensor shall modulate mixing dampers, preheat coil valve, and cooling coil valve, in sequence, to maintain discharge air temperature. Discharge air temperature shall be maintained at 55 deg F (adj.), or may be reset with a PI or PID control loop based on return air temperature (for energy efficiency). Hot and chilled water control valves shall not be open simultaneously, and their operation shall be coordinated with economizer mode. If economizer mode is enabled, the cooling coil valve is shut and the mixing dampers and preheat coil valve modulate, without overlap, to maintain discharge air temperature. If economizer mode is disabled, the mixing dampers are set to allow minimum outside air, and the preheat coil and cooling coil valves modulate, without overlap, to maintain discharge air temperature.

9. Outside Air Dampers (and RA and EA Dampers): Outside air damper shall modulate to maintain the programmed design outside air cfm, as measured by the outside air flow station, unless overridden by an economizer routine (or by a CO2 sensor). RA and EA dampers shall modulate in concert with OA dampers to maintain air balance.

10. CO2 Sensor: A CO2 sensor mounted in the return air ductwork shall modulate the outdoor, exhaust and return air quantities to maintain a CO2 setpoint of less than 600 ppm (adj.).

11. Zone Air Flow: VAV box dampers shall modulate to maintain measured VAV box airflow at the programmed setpoint, as programmed at the OWS. Full flow shall be provided when a zone is calling for cooling, and lower flow (as noted on drawings) may

be required when a zone is calling for heating.

12. Space Temperature: Space temperature sensors or thermostats shall modulate main reheat coils to maintain space setpoints of 70 – 75 deg F (adj.) during occupied mode, with night setback/setup during unoccupied mode.

13. Space RH: Return air humidity sensor shall modulate humidifier to maintain RH setpoint of 30% (adj.). Discharge air humidity sensors shall provide high-limit protection by shutting off humidifier if discharge air RH exceeds high limit setpoint.

14. Unoccupied Mode: When the unit shuts down, the supply and exhaust fan shall stop, the OA and EA dampers shall fully close, the RA damper shall fully open, and the humidifier shall be locked out. In unoccupied mode, the space sensing the lowest temperature shall cycle the unit on, with 100% return air, and modulate the respective reheat coil valve(s) to maintain night setpoint. When outside air temperature is below 35 deg F, the preheat coil valve shall be set for constant 10% flow during unoccupied periods, to prevent nuisance tripping of freezestats.

D. Air Handling Unit: AHU 6-A (6th Floor Special Collection) (Constant Volume)[Add Alternate #4]

1. Air handling system shall be operated by the DDC system, based on a programmed schedule and/or operating strategy, with monitoring and control from the OWS.

2. Time Schedule: Start and stop supply and exhaust fans through the DDC system as determined by programmed operating schedule. Determine fan status through auxiliary contactors in motor starter. If fan fails to start as commanded, signal alarm.

3. Safety Devices:
   a. Freeze Protection: Stop fans, close outside air dampers, shut down all induct humidifiers, and set induct heating coil valves to 100% open if temperature before supply fan is below 37 degrees F (3 degrees C); signal alarm. This condition must be manually reset.
   b. Smoke Detector: Stop fans, close outside air dampers, and signal alarm.

4. Occupied Mode: Occupied times [initially set at 100%] will be determined by the DDC system. In occupied mode, supply and exhaust fans will run continuously. When supply fan starts, OA, RA and EA dampers will assume minimum position.

5. Supply Fan Speed Control: Supply fan is constant speed.

6. Exhaust Fan Speed Control: Exhaust fan VFD speed shall be modulated so that exhaust air cfm equals outside air cfm minus exhaust and pressurization, and building pressure in the Special Collections Area is maintained constant.

7. Discharge Air Temperature: Discharge air temperature sensor shall modulate dampers, preheat coil valves, and main cooling coil valve, in sequence, to maintain a reset (65 deg F winter – 55 deg F summer) discharge air temperature and a discharge air temperature

off of the cooling coil of 45 deg F (adj.).

8. In-Duct Heating Coils: The space temperature sensor in each zone will modulate the duct coil control valve to satisfy zone requirements. A discharge temperature sensor downstream of each coil will limit discharge temperature to a minimum of 65 deg F in winter and 55 deg F in summer.

9. Outside Air Dampers (and RA and EA Dampers): Outside air damper shall modulate to maintain the programmed design outside air cfm, as measured by the outside air flow station, which is determined by a CO2 sensor. RA and EA dampers shall modulate in concert with OA dampers to maintain air balance.

10. CO2 Sensor: A CO2 sensor mounted in the return air ductwork as indicated on Drawing MH106 shall modulate the outdoor, exhaust and return air quantities to maintain a CO2 setpoint of less than 600 ppm (adj.).

11. Space Temperature: Space temperature sensors or thermostats shall modulate induct heat coils to maintain space setpoints of 70 – 75 deg F (adj.).

12. Space RH: Individual space humidity sensor shall modulate the respective humidifier to maintain RH setpoint of 30% (adj.). Discharge air humidity sensors shall provide high-limit protection by shutting off humidifier if discharge air RH for that space exceeds high limit setpoint.

E. Air Handling Unit: AHU-6B (Constant Volume) [Add Alternate #4]

1. Air handling systems shall be operated by the DDC system, based on a programmed schedule and/or operating strategy, with monitoring and control from the OWS.

2. Time Schedule: Start and stop supply and exhaust fans through the DDC system as determined by programmed operating schedule. Determine fan status through auxiliary contactors in motor starter. If fan fails to start as commanded, signal alarm.

3. Safety Devices:
   a. Freeze Protection: Stop fans, close outside air dampers, shut down humidifier, and set preheat coil valve to 100% open if temperature before supply fan is below 37 degrees F (3 degrees C); signal alarm. This condition must be manually reset.
   b. Smoke Detector: Stop fans, close outside air dampers, and signal alarm.

4. Occupied Mode: Occupied and unoccupied times will be determined by the DDC system. In occupied mode, supply and exhaust fans will run continuously. When supply fan starts, OA, RA and EA dampers will assume minimum position.

5. Supply Fan Speed Control: Supply fan speed shall be constant.

6. Exhaust Fan Speed Control: Exhaust fan VFD speed shall be modulated so that exhaust air cfm equals outside air cfm minus exhaust and pressurization, and building pressure on the sixth floor is maintained constant.

7. Economizer Mode: The economizer mode is enabled when the outside air temperature is below 55 deg F. When the economizer mode is enabled, the cooling coil valve is shut. When the economizer mode is disabled, the mixing dampers are set to allow minimum outside air.

8. Discharge Air Temperature: Discharge air temperature sensor shall modulate mixing dampers, preheat coil valve, and cooling coil valve, in sequence, to maintain discharge air temperature. Discharge air temperature shall be maintained at 55 deg F (adj.), or may be reset with a PI or PID control loop based on return air temperature (for energy efficiency). Hot and chilled water control valves shall not be open simultaneously, and their operation shall be coordinated with economizer mode. If economizer mode is enabled, the cooling coil valve is shut and the mixing dampers and preheat coil valve modulate, without overlap, to maintain discharge air temperature. If economizer mode is disabled, the mixing dampers are set to allow minimum outside air, and the preheat coil and cooling coil valves modulate, without overlap, to maintain discharge air temperature.

9. Outside Air Dampers (and RA and EA Dampers): Outside air damper shall modulate to maintain the programmed design outside air cfm, as measured by the outside air flow station, unless overridden by an economizer routine or by a CO2 sensor. RA and EA dampers shall modulate in concert with OA dampers to maintain air balance.

10. CO2 Sensor: A CO2 sensor mounted in the return air ductwork shall modulate the outdoor, exhaust and return air quantities to maintain a CO2 setpoint of less than 600 ppm (adj.).

11. Space Temperature: Space temperature sensors or thermostats shall modulate heating coil to maintain space setpoints of 70 – 75 deg F (adj.) during occupied mode, with night setback/setup during unoccupied mode.

12. Space RH: Return air humidity sensor shall modulate humidifier to maintain RH setpoint of 30% (adj.). Discharge air humidity sensors shall provide high-limit protection by shutting off humidifier if discharge air RH exceeds high limit setpoint.

13. Unoccupied Mode: When the unit shuts down, the supply and exhaust fan shall stop, the OA and EA dampers shall fully close, the RA damper shall fully open, and the humidifier shall be locked out. In unoccupied mode, the space sensing the lowest temperature shall cycle the unit on, with 100% return air, and modulate the respective heating coil valve to maintain night setpoint. When outside air temperature is below 35 deg F, the heating coil valve shall be set for constant 10% flow during unoccupied periods, to prevent nuisance tripping of freezestats.

3.04 ELEVATOR MACHINE ROOMS

A. On room temperature above 85 degrees F (29 degrees C), operate fan coil unit in a cooling mode.

3.05 RADIATION AND CONVECTORS

A. Single temperature thermostat set at 75 degrees F (24 degrees C) maintains constant space temperature during the day and 15 degrees F (8 degrees C) cooler at night by modulating two-way control heating valve with spring range of 3 to 7 psig (20 to 48 kPa).

END OF SECTION 15940

SECTION 15950

TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems by General Contractor.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

1.02 SUBMITTALS

A. See Section 01330 – Submittal Procedures and Section 01400 – Quality Requirements for submittal procedures.

B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.

3.02 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.03 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

END OF SECTION 15950

SECTION 16010

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 REFERENCES

A. Conditions of the Contract, Specifications, Change Orders, Addenda, Drawings and Division 1 General Requirements, apply to work of this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

B. As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions", and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.2 EXAMINATION OF SITE

A. Before submitting a bid, the Electrical Subcontractor shall visit and carefully examine site to identify existing conditions and difficulties that may affect the work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions.

B. Before starting work in a particular area of the project, the Electrical Subcontractor shall examine the conditions under which work must be performed including preparatory work performed under other Sections of the Contract, or by the Owner and report conditions which might adversely affect the work in writing to the Architect. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.3 SCOPE

A. The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings. The Electrical Subcontractor shall completely coordinate the work of this section with the work of other trades.

B. The Electrical Subcontractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements. The Electrical Subcontractor shall pay utility backcharges and excess costs and perform work in accordance with utility company requirements.

4. Factory Mutual Association (FM)

5. National Electrical Code (NEC)

6. National Electrical Safety Code (NESC).

7. The BOCA National Building Code.

B. All materials and equipment shall be listed by Underwriters Laboratories (UL), and approved for intended service.

C. When requirements cited in this Paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work. The Architect may relax this requirement when such relaxation does not violate the ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.

1.6 WARRANTY

A. Refer to Division 1 General Requirements for Warranty Requirements.

1.7 CONTRACT DRAWINGS

A. Work to be performed under this section is shown on the electrical drawings listed in Division 1 General Requirements.

B. The listing of electrical drawings does not limit responsibility of determining full extent of work required by contract documents. The Electrical Subcontractor shall refer to architectural, plumbing, HVAC, structural, and other drawings and other sections that indicate types of construction with which work of this section must be coordinated. The Electrical Subcontractor shall check with the General Contractor and other subcontractors to determine whether there will be any interference by such trades with the electrical work. If the Electrical Subcontractor fails to check with the General Contractor and subcontractors and the electrical work is later found to interfere with their work, then he shall make necessary changes, without additional cost to the Owner, to eliminate such interference.

C. Drawings are diagrammatic and indicate general arrangement of systems and work included in contract. information and components shown on riser diagrams or called for in the specifications but not shown on plans, and vice versa, shall apply and shall be provided as though required expressly by both. It is not intended to specify or to show every offset, fitting, or component; however, contract documents require components and materials whether or not indicated or specified as necessary to make electrical installation complete and operational.

1.8 DISCREPANCIES IN DOCUMENTS

A. It shall be the responsibility of each bidder to examine the drawings and specifications carefully before submitting his bid, with particular attention to errors, omissions, conflicts with provisions of laws and codes imposed by authorities having jurisdiction, conflicts

between portions of drawings, or between drawings and specifications, and ambiguous definition of the extent of coverage in the contract. Any such discrepancy discovered shall be brought to the immediate attention of the Architect for correction. Should any of the aforementioned errors, omissions, conflicts or ambiguities exist in either or both the drawings and specifications, the Electrical Subcontractor shall have the same explained and adjusted in writing before signing the contract or proceeding with work. Failure to notify the Architect in writing of such irregularities will cause the Architect's interpretation of the Contract Documents to be final. No additional compensation will be approved because of discrepancies thus resolved.

B. The drawings and these specifications are intended to comply with all the above mentioned rules and regulations. If discrepancies occur, the Electrical Subcontractor shall immediately notify the Architect in writing of said discrepancies and apply for an interpretation and, unless and interpretation is offered in writing by the Architect prior to the execution of the contract, the applicable rules and regulations shall be complied with as a part of the contract.

C. In case of difference between building codes, specifications, state laws, industry standards and the contract documents, the most stringent shall govern. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all costs arising in correcting these deficiencies.

1.9 EQUIPMENT AND MATERIALS

A. All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite, but shall be replaced with new materials.

B. All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.

C. No equipment or material shall be installed in such a manner as to void a manufacturers warranty. The Electrical Subcontractor shall notify the Architect of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work.

1.10 RECORD DRAWINGS

A. As work progresses, and for duration of the Contract, the Electrical Subcontractor shall maintain a complete and separate set of prints of Contract Drawings at job site at all times and record work completed and all changes from original Contract. Drawings shall clearly and accurately include work installed as a modification or added to the original design.

B. At completion of work and prior to final request for payment, the Electrical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

1.11 SHOP DRAWINGS

A. Refer to Division 1 for General Requirements.

B. If the Electrical Subcontractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.

C. Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

1.12 BULLETINS, MANUALS, AND INSTRUCTIONS

A. The Electrical Subcontractor shall obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items and assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as-built wiring diagrams. Manuals shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into two sections or books as follows:

1. Directions for and sequence of operation of each item of electrical systems, e.g. emergency generator, sound system, fire alarm system, etc.

2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance.

B. Furnish three copies of manuals to the Architect for review and distribution to Owner. Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.

C. Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any and all parts of various systems. Such instructions shall cover period of control such as will take mechanical equipment through complete cycle. Make adjustments under actual operating conditions.

1.13 SPACE, EQUIPMENT ARRANGEMENT AND ACCESS

A. The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Subcontractor to determine if the equipment he proposed to furnish will fit the space available. Shop drawings shall be prepared by the Subcontractor when required by the Architect, Engineer or Owner to indicate a suitable arrangement.

B. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Engineer and Architect.

C. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

1.14 MARKING AND LABELING

A. All panelboards, indoor transformers, cabinets and other specified equipment shall be labeled with engraved laminated plastic plates, minimum 3/4" high with 3/8" engraved letters. Punch tapes with mastic backings are not acceptable.

B. All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters. Where individual switches or circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with 1/2" high labels.

C. All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

D. Cardholders for panelboard shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.

1.15 WORK IN EXISTING FACILITIES

A. All work shall be accomplished while the Owner's facility is in normal operation. All construction activities shall be conducted with minimal disruption to the Owner's operation.

B. Power outages, bus tie-ins, service change overs and the like shall be scheduled in writing with the Owner.

1.16 WIRING METHODS

A. Unless otherwise noted, all wiring shall be installed in raceway.

1. All conduit installed outdoors, all risers between floors and conduit exposed to physical damage shall be rigid steel, rigid aluminum or intermediate metal conduit.

2. Unless otherwise noted, all power distribution wiring including feeders and branch circuits shall be installed in electrical metallic tubing (EMT). Branch circuits concealed within existing gypsum wallboard shall be permitted to be type MC cable.

3. All fire alarm system wiring shall be installed in EMT.

4. All control wiring including automatic temperature control wiring provided by Division 15000 shall be installed in EMT.

5. All Emergency Power Distribution wiring shall be installed in EMT.

6. All voice/data wiring shall be installed in cable tray or EMT. Installation of the raceway is by the electrical contractor. Installation of wire is by others.

7. All conduit in corrosive areas shall be PVC coated rigid steel.

END OF SECTION 16010

SECTION 16030

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 GENERAL

A. Provisions of Section 16010, General Requirements for Electrical Work apply to the work of this Section.

B. This Specification Section covers the field inspection, mechanical completeness, and electrical acceptance tests required for electrical apparatus, wire, cable and other miscellaneous equipment and material installed and wired by Contractor.

C. The Contractor shall prepare written procedures for the performance of all testing. The procedures shall include an itemization of all equipment, devices, cable and material requiring field testing, setting, adjustment or calibration and shall describe the required set points. The procedures shall be submitted to the Engineer for review prior to the commencement of any testing.

D. The Contractor shall maintain records for all tests and inspections, with complete data on all readings taken. Test results shall be recorded on standard test forms. All reports shall be dated and shall include the name of the person performing the test.

PART 2 - PRODUCTS

2.1 GENERAL

A. The equipment to be tested under this Section is generally provided under other Specification Sections.

PART 3 - EXECUTION

3.1 EXECUTION

A. Upon completion of the installation, the Contractor shall perform field tests on all equipment, materials and systems to insure that the entire installation is sound and that all circuits, including power, control, relaying, instrumentation and metering will function properly and as intended.

B. The Contractor shall furnish and maintain all tools, instruments, materials, test equipment, test connections and personnel, including supervision and labor required for testing, setting and adjusting of all electrical equipment.

C. All tests shall be performed with proper regard for the protection of equipment and the Contractor shall be responsible for adequate protection of all personnel during such tests.

D. No equipment shall be installed, operated or tested in such a manner as to void the

manufacturer's warranty or guarantee. Should any test values or procedures as indicated in this Specification exceed the values or overrule the procedures recommended by the manufacturer for the equipment involved, the manufacturer's recommendation, shall take precedence.

E. Prior to energizing or placing in service any electrical equipment, testing and checking shall be completed.

F. The witnessing or waiving of witnessing of any test shall not relieve the Contractor of its guarantees for material, equipment and workmanship.

G. The Contractor shall promptly advise the Engineer in writing concerning the failure of any equipment or material to pass the tests performed, or to properly function as intended, or to meet calibration accuracy required. After the defects have been corrected, the test(s) shall be repeated.

3.2 PAD-MOUNTED TRANSFORMERS

A. Liquid type

1. Inspect for leaks.
2. Verify proper liquid level.
3. Sample and test liquid.
   a. Dielectric strength
   b. Color
   c. Acidity
4. Insulation resistance test, winding to winding and winding to ground (Megger).
5. Verify proper grounding.
6. Turns ratio test at all tap positions.
7. Other field tests recommended by the manufacturer.

3.3 DRY TYPE TRANSFORMERS (GENERAL PURPOSE POWER AND LIGHTING)

A. Check primary and secondary connections for correctness.

B. Check secondary neutral for proper bonding to ground.

C. Perform one minute megger tests of the primary windings to ground with the secondary grounded and secondary windings to ground with the primary grounded.

D. After transformers are energized check secondary voltage and adjust taps as necessary.

3.4 ROTATING EQUIPMENT

A. All motors shall be subjected to a one minute megger test, resistance measured to ground with all phase leads tied together. Minimum insulation resistance values are as follows:

Equipment Rating (volts)	600 or less
Megger Rating (volts)	1000
Min Resistance (megohms)	10

If minimum resistance values are not obtained, the equipment shall be dried out as required, and the above test repeated.

B. The following visual inspection shall be made on all motors:

1. Check bearings for free rotation.
2. Check all ventilation openings for blockages.
3. Check bearing lubrication and correct as necessary.
4. Check that frame is grounded.
5. Check motor leads for proper connection and color coding.

C. The Contractor shall check all motors for proper rotation by bumping motors. Coupled motors shall not be bumped. The Contractor shall correct motor connections as necessary.

END OF SECTION 16030

SECTION 16050

INSTALLATION OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010 General Requirements for Electrical Work apply to the work of this section.

B. Included in the work of this section is the assembly, installation and wiring of all parts, subassemblies and shipping sections of panelboards, disconnect switches, variable speed drives and similar equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equipment to be installed under this section is generally furnished under other specification sections.

PART 3 - EXECUTION

3.1 GENERAL

A. All equipment shall be completely assembled, installed and connected and shall be fully prepared and made ready for operation. The Contractor may employ the use of any special tools furnished with the equipment specifically for installation purposes, but shall not use tools furnished with the equipment for maintenance purposes. The Contractor shall acquaint himself with and follow special instructions of the Manufacturer for the care, handling and installation of the equipment.

B. After installation, all operating parts shall be inspected to insure correct mechanical operation.

C. Internal wiring within any equipment which as been disconnected for shipping purposes shall be reconnected. Any wiring not installed by reason of shipping requirements shall also be installed. The Contractor may disconnect internal wiring as necessary for installation purposes, and shall reconnect all wiring so disconnected.

D. After installation, all equipment shall be left in clean conditions. In particular, all insulators, bushings, insulating materials, and other parts which are depended upon for their insulating qualities shall be thoroughly cleaned.

E. No overall painting of equipment will be required, but housing surfaces which have been soiled or marred shall be touched up or refinished with primer and color coat.

F. Drilling, tapping, cutting, or welding of equipment required for mounting or for conduit and cable entrances to suit particular conditions of installation shall be considered as part of electrical equipment installation.

G. All equipment shall be provided with engraved nameplates in accordance with Section 16010 and the drawings.

3.2 SUPPORTS

A. The Contractor shall size and provide all supports necessary for the installation of the electrical equipment.

B. Supports shall be designed for seismic forces in accordance with the 1999 BOCA National Building Code, Section 1610.

C. Channel framing shall be manufactured by Unistrut, Kindorf, B-Line or approved equal.

D. In dry, non corrosive areas, channel framing shall be galvanized steel or aluminum and all nuts, bolts and hardware shall be carbon steel, cadmium plated or hot dipped galvanized.

E. In outdoor, wet or damp areas channel framing shall be aluminum or 304 stainless steel and nuts, bolts and hardware shall be 304 stainless steel.

F. In corrosive areas, channel framing shall be 316 stainless steel, PVC coated steel or PVC coated aluminum. Nuts, bolts and hardware shall be 316 stainless steel.

G. Supports shall be sized with a minimum safety factor of four or 200 lbs. whichever is greater.

H. Fastening to steel may be welded or bolted. Fastening to solid masonry or concrete shall be machine bolts with expansion shields. Fastening to hollow masonry shall be by toggle bolts.

3.3 WIRING

A. All external connections to electrical equipment shall be completed by the Electrical Subcontractor. Wiring shall be neatly formed, trained and tied with nylon cable ties in all equipment.

B. All power conductors shall be color coded. All control wiring shall be identified with sleeve type wire markers with wire numbers matching those on the manufacturers schematic and connection diagrams.

C. All bus work shall be properly phased "A", "B", "C" left to right, front to back or top to bottom.

3.4 PANELBOARDS AND DISTRIBUTION PANELS

A. The Contractor shall mount equipment at locations shown on the drawings, install all interiors, branch circuit protective devices, complete all external connections and install exterior trim.

B. The panelboard circuit directory card shall be completed in accordance with Section 16010.

3.5 MOTOR SAFETY SWITCHES, LOCAL MOTOR STARTERS AND VARIABLE SPEED DRIVES

A. Equipment shall be installed at locations shown on the drawings. The Contractor shall provide all support material and framing required for proper support.

B. Enclosures installed on concrete surfaces or surfaces where condensation is likely to occur shall clear the mounting surface by at least 1/4 inch.

C. Conduit shall be bottom entry to all enclosures installed outdoors or in wet or damp areas.

3.6 TRANSFORMERS

A. Transformers shall be floor mounted at locations shown on the drawings. The Contractor shall provide all support material and hardware.

B. Transformers shall be installed with adequate cooling space in accordance with the manufacturers recommendations, a minimum of 6" from wall..

C. Transformer neutral shall be grounded in accordance with NEC Article 250.

D. Provide flexible conduit, minimum 2-feet length, for final connections to transformer case.

E. Provide seismic restraints.

3.7 MOTORS

A. Motor connections shall be made with compression lugs installed on the motor leads and the motor branch circuit conductors, bolted together.

B. Motor connections shall be wrapped with varnished cambric tape, then insulated with Super 33 Scotch Vinyl electric tape or insulated with motor connection kits as manufactured by Raychem or 3M.

END OF SECTION 16050

SECTION 16060

INSTALLATION OF WIRE AND CABLE

PART 1 - GENERAL

1.1 GENERAL

A. The Provisions of Section 16010 General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS:

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled where applicable.

IEEE 48 Standard Test Procedures and Requirements for High Voltage Alternating Current Cable Terminations.

UL 486A Wire Connectors and Soldering Lugs for use with Copper Conductors.

UL 510 Electrical Insulating Tape

1.3 SUBMITTALS

A. Manufacturers product data sheets

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

A. Wire and cable are specified in other Sections of Division 16000.

2.2 TERMINATIONS AND SPLICES

A. Power Wiring:

1. Terminal lugs, connectors and splices shall be tin plated, high conductivity copper compression type. They shall have chamfered barrels and be permanently identified with conductor sizes.

2. Terminal lugs for conductors No. 3/0 AWG and larger shall be long barrel NEMA two hole type.

3. Splices shall be long barrel butt type with a center stop in the splice barrel.

4. Hydraulic crimping tools with proper die sizes which require full closure before reopening shall be used.

SECTION 16070

GROUNDING

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010, General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS:

A. Products shall comply with the following codes and standards and shall be UL listed and labeled.

NFPA 70	National Electrical Code
UL 467	Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Bare grounding conductors shall be soft drawn stranded copper, sized in accordance with NEC Article 250 unless otherwise noted on the Drawings.

B. Insulated grounding conductors shall be stranded copper with Type TW, THW or THHN/THWN insulation colored green.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUNDING CONDUCTORS

A. A separate insulated green copper conductor shall be installed as an equipment grounding conductor in all raceway and with every feeder, branch circuit and control circuit. This shall be in addition to the grounded metallic conduit system.

B. All equipment grounding conductors shall be terminated at both ends.

3.2 RACEWAY, CABLE TRAY AND EQUIPMENT

A. All raceway, cable tray and non-current carrying metal equipment and enclosures shall be electrically continuous and bonded to the grounding system.

B. Where equipment is provided with a ground bus all equipment grounding conductors shall be terminated on the bus. The Contractor shall perform all drilling and tapping required and provide all hardware.

C. All conduit terminating on the cable tray system shall be provided with grounding bushings and bonded to the cable tray grounding conductor.

END OF SECTION 16070

SECTION 16110

RACEWAY AND FITTINGS

PART 1 - GENERAL

1.1 GENERAL

A. Provisions of Section 16010 General Requirements for Electrical Work apply to the work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ANSI C80.1	Standard for Rigid Steel Conduit
NEMA RN-1	Polyvinyl-chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
NEMA TC-2	Electrical Plastic Tubing and Conduit
NEMA TC-3	PVC Fittings for use with Rigid PVC Conduit and Tubing
UL 1	Flexible Metal Conduit
UL 6	Rigid Metal Conduit
UL 360	Liquid Tight Flexible Steel Conduit
UL 514B	Fittings for Conduit and Outlet Boxes
UL651	Schedule 40 and 80 Rigid PVC Conduit
UL797	Electrical Metallic Tubing
UL870	Wireways, Auxilliary Gutters and Associated Fittings
UL1242	Intermediate Metal Conduit

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid steel conduit shall be of mild steel piping with a uniform protective coating of hot dipped galvanizing inside and outside, including all threads. The conduit shall be furnished in nominal 10-foot lengths, with both ends threaded and one coupling (galvanized inside and out) applied to each length. The threads opposite the coupling end shall be protected by a plastic cap.

B Rigid aluminum conduit, couplings and elbows shall be manufactured of a suitable copper-free aluminum alloy. Conduit lengths shall be seamless throughout and shall have hard, smooth and gum-free interior coatings to facilitate the pulling-in of conductors. It shall be furnished in nominal 10-foot lengths, with both ends threaded and a coupling applied to one end of each length. Threads on the coupling end shall be coated with a special lubricant so that the coupling may be removed without difficulty. Threads on the end opposite the coupling shall be protected from damaged by a plastic cap.

C. All cut threads shall be thoroughly painted with a coating of a rust inhibiting primer.

D. EMT couplings and fittings shall be compression type up to 1 –1/4 inch and double set screw type 1-1/2 inch and larger.

E. All conduit terminations in panels, enclosures, outlet boxes and equipment shall be provided with bushings.

3.5 FLEXIBLE CONDUIT

A. Flexible conduit shall be use to terminate all lighting (except pendant hung), motors, unit lanterns, transformers, pilot devices and vibrating equipment.

B. Liquitite flexible conduit and fittings shall be used outdoors and in all damp or wet areas, or where exposed to grease or oil.

C. Connections to lighting fixtures shall be maximum length of 6 feet. All other flexible connections shall be maximum 18 inches.

3.6 PENETRATIONS

A. Fire resistant walls and floors shall be sealed with approved material, and shall maintain the original fire rating. Refer to specification 07841 for materials.

END OF SECTION 16110

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 GENERAL

A. The Provisions of Section 16010 General Requirements for Electrical Work apply to the Work of this Section.

B. Devices and cover plates shall match wall finishes unless otherwise noted.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. Receptacles shall be straight blade, commercial grade, grounding type, side wired, NEMA 5-20R unless otherwise noted.

2.2 SWITCHES

A. Standard switches shall be toggle or key type as called for on the drawings. Commercial grade, 120/277V, 20A, side wired.

B. Passive Infrared (PIR) wall switches. PIR wall switches shall be rated 277V, 1200 watt fluorescent, and contain an auto-off switch. They shall provide a minimum 900 sq. ft., 180° coverage. Acceptable manufacturers are Hubbell and Watt Stopper.

C. Ultrasonic Occupancy Ceiling Sensors. Ultrasonic occupancy ceiling sensors shall be rated 24V DC and provide a minimum 10 ft x 90 ft coverage in the hallway areas (type 1 on the drawings) and a minimum 2000 sq. ft., 360° coverage for open areas (type 3 on the drawings). Occupancy sensors controlling 2 power packs shall be provided with an additional isolated relay. Power packs shall be rated 277V unless otherwise noted. Acceptable manufacturers are Hubbell and Watt Stopper.

D. Dual Technology Ceiling Sensors. Dual technology ceiling sensors shall be rated 24V DC and provide a minimum 1500 sq. ft., 360° coverage. Power packs shall be rated 277V. Acceptable manufacturers are Hubbell and Watt Stopper.

2.3 FLOOR MOUNTED DEVICES

A. Floor mounted devices shall be Poke-Through assemblies containing a below the floor junction box with multichanneled, through floor raceway/firestop and detachable floor service outlet assembly. It shall contain wiring for one duplex outlet, and provisions for one voice cable and one data cable. Voice/data wiring and jacks are by others. Floor service outlet assembly shall be flush in carpeted areas and tombstone style in tiled areas. Flush devices shall be polished brass. Tombstone devices shall be gray painted aluminum. Acceptable manufacturers are Hubbell and Wiremold.

END OF SECTION 16140

SECTION 16200

600 VOLT WIRE

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010, General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ASTM B-3	Soft or Annealed Copper Wire
ASTM B-8	Concentric Lay Stranded Copper Conductors
NEMA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
UL 44	Rubber Insulated Wires and Cables
UL 83	Thermoplastic Insulated Wires and Cables

1. 3 SUBMITTALS

A. Manufacturer's product data sheets.

PART 2 - PRODUCTS

2.1 GENERAL

A. All conductors shall be annealed copper in accordance with ASTM B-3.

B. The jacket of all wire shall be printed with the following information:

1. Manufacturer
2. Size
3. Insulation type
4. Maximum voltage
5. UL label

C. All insulation shall be rated 600 volt.

2.2 POWER WIRING

A. Feeders and motor branch circuits shall be type XHHW.

B. All power wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #12 AWG.

2.3 BRANCH CIRCUITS

A. All lighting and convenience receptacle branch circuit wiring shall be type THHN/THWN.

B. Branch circuit wiring shall be solid or stranded conductor, minimum size #12 AWG.

2.4 CONTROL WIRING

A. Wiring for control circuits shall be THHN/THWN.

B. Control wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #14 AWG.

2.5 FIXTURE WIRE

A. Where high temperature fixture wire is required it shall be silicone rubber type SF-2.

PART 3 - EXECUTION

3.1 GENERAL

A. All wire shall be installed in accordance with Section 16060, Installation of Wire and Cable.

END OF SECTION 16200

SECTION 16325

PAD-MOUNTED DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010, General Requirements for Electrical Work apply to the Work of this Section.

B. This specification section describes the requirements for pad-mounted distribution transformers. The equipment shall be suitable for continuous operation at rated KVA in ambient temperatures ranging from minus (-) 30° C to 40° C. The enclosure shall be designed for the effects of blowing rain and snow and melting ice and snow.

1.2 CODES AND STANDARDS:

Products shall comply with the following codes and standards:

ANSI/IEEE C57.12.00	General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
ANSI C57.12.22	Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers with High-Voltage Bushings, 2500 kVA and Smaller: High-Voltage, 34,500 GrdY/19 920 Volts and Below; Low-Voltage, 480 Volts and Below.
ANSI C57.12.26	Standard for Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors, High-Voltage, 34,500 GrdY/19 920 Volts and Below; 2500 kva and Smaller.
ANSI C57.12.28	Switchgear and Transformers - Pad-Mounted Equipment - Enclosure Integrity.
ANSI C57.12.70	Terminal Markings and Connections for Distribution and Power Transformers.
ANSI/IEEE C57.12.80	Terminology for Power and Distribution Transformers.
ANSI/IEEE C57.12.90	Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers.
NEMA TR-1	Transformers, Regulators and Reactors

2.10 ACCESSORIES

A. Provide the following accessories with each transformers, installed in the low voltage compartment:

1. Pressure vacuum gauge.
2. Dial type thermometer.
3. Liquid level gauge.
4. Drain valve with sampling device.

B. Provide parking stands that shall be located in the primary compartment of each transformer and shall be provided for each primary bushing.

C. Provide outline drawing on inside of secondary cabinet in an easily accessible location.

D. Provide instrument transformers and meter socket, in accordance with utility company standards, to provide primary side metering.

PART 3 - INSTALLATION

3.1 GENERAL

A. Transformers shall be set level, anchored and installed in accordance with manufacturer's instructions. Ground pads shall be bonded to (2) ¾" x 10' long copper clad steel ground rods.

B. Cable shall be terminated in accordance with Section 16060, Installation of Wire and Cable.

C. Field tests shall be performed in accordance with Section 16030, Electrical Acceptance Testing.

D. Transformer shall be provided with pre-cast concrete pad with vault. Note – existing vault may be reused if it will accommodate larger 9' x 9' pad.

END OF SECTION 16325

SECTION 16415

MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010, General Requirements for Electrical Work apply to the Work of this Section.

B. The work of this section includes locally installed, enclosed combination magnetic motor starters and manual motor starters.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL listed and labeled.

NEMA ICS-2	Industrial Control Devices, Controllers and Assemblies.
UL 508	Industrial Control Equipment.

1.3 SUBMITTALS

A. Manufacturers Product Data Sheets

B. Dimensioned Outline Drawings.

C. Control wiring diagrams.

1.4 MANUFACTURERS

Subject to compliance with the specification requirements.

Allen-Bradley
Cutler-Hammer
Furnas Electric
General Electric
Square D

PART 2 - PRODUCTS

2.1 MAGNETIC MOTOR STARTERS

A. Unless otherwise noted, magnetic motor starters shall be NEMA rated full voltage type. The disconnecting means shall be circuit breaker type, non-fused or fused switch as shown on the Drawings. Minimum starter size shall be NEMA 1.

B. All components including the disconnecting means shall be installed in a single enclosure rated NEMA 1 for indoor locations and NEMA 3R or 4 for wet, damp and outdoor locations.

C. The disconnecting means shall be provided with an external operating handle which is interlocked to prevent opening the door when the handle is in the ON position and prevent closing the disconnect when the door is opened. The interlock shall be defeatable. The handle shall be padlockable in the OFF position.

D. Circuit breakers shall be adjustable magnetic trip, motor circuit protector type.

E. The short circuit rating of the assembly shall be of the same rating as the panelboard circuit breaker feeding the assembly.

F. Each motor starter shall be provided with a control power transformer to provide 120 VAC control power. The transformer shall be provided with two primary fuses and one secondary fuse. The transformer shall be extra capacity with a minimum rating of 100 VA.

G. Overload relays shall be three pole, trip free, manually reset Class 20, solid state, with an external reset mechanism.

H. Contactor coils shall be provided with surge suppressors.

I. Sufficient auxiliary contacts shall be provided for all interlocks. A minimum of one normally opened and one normally closed spare contacts shall be provided.

J. Door mounted pilot devices shall be heavy duty oil tight. Pilot lights shall be transformer type. A HAND-OFF-AUTO maintained contact selector switch, red RUN and green READY pilot lights shall be provided on each enclosure.

K. All control wiring shall be brought to terminal blocks for connection of field cabling. Minimum wire size shall be #14 AWG.

L. Connections for motor leads shall be suitable for copper conductors applied at their 75 degree C rating.

2.2 MANUAL MOTOR STARTERS

A. Single phase fractional HP manual motor starters shall be toggle operated, enclosed, one or two pole switches as required by the installation.

B. The enclosure shall be NEMA 1 for indoor locations and NEMA 3R or 4 for outdoor, wet and damp locations. A handle guard shall be provided to allow the toggle operator to be padlocked in the OFF position.

C. Starters shall be provided with trip free melting alloy overloads where required.

E. The cabinet shall be provided with a copper equipment ground bus. A bonding jumper shall be provided between the enclosure and the door.

2.9 WIRING

A. Power and control wiring shall be segregated from wiring sensitive to noise.

B. Control wiring shall be No. 14 AWG stranded or larger.

C. Signal leads shall be No. 16 AWG shielded, 600 volt insulation.

D. Easily accessible and labeled terminal strips shall be provided for signal leads and 120 volt control field connections.

E. Each wire or cable termination, except for printed circuit board connections, shall be clearly and permanently identified with wire numbers at both ends.

F. Connections to equipment located on the doors and hinged frames shall be flexible, looped and arranged to prohibit chafing on the edges of the door or frame or interference in any way with the operation of other equipment.

PART 3 - EXECUTION

3.1 The drive manufacturer shall provide start-up service assistance for drive set-up, adjustment and field checking and testing. Training shall be provided to the owner on typical drive set-up and programming by a qualified drive representative.

3.2 Drives shall be installed in accordance with manufacturers written instructions and Section 16050, Installation of Electrical Equipment.

END OF SECTION 16420

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010, General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA AB-1	Molded Case Circuit Breakers
NEMA PB-1	Panelboards
UL 50	Enclosures for Electrical Equipment
UL 67	Panelboards
UL 489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
UL 943	Ground Fault Circuit Interrupters

1.3 SUBMITTALS

A. Manufacturer's product data sheets.

B. Circuit breaker schedules. Breaker assignments shall agree with contract drawings.

1.4 MANUFACTURERS

A. Subject to compliance with the Specification requirements:

Cutler-Hammer
General Electric
Square D
Siemens

PART 2 - PRODUCTS

2.1 GENERAL

A. Panelboards, including lighting and appliance panelboards and power distribution panelboards, shall be of the sizes, rating and arrangement shown on the Drawings.

B. Panelboards shall be provided complete with all overcurrent devices, accessories and trim.

C. All panelboards shall be provided with safety barriers for dead front construction.

D. The required short circuit ratings of assembled panelboards are shown on the Drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the Drawings, series rated combinations will not be permitted.

2.2 CABINETS

A. Boxes shall be code gauge galvanized sheet steel.

B. Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.

C. Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.

D. Directory frames shall be metal frame with plastic covers.

2.3 BUS

A. All bus work shall be 1000 amp/sq.in. copper.

B. Unless otherwise noted on the Drawings, neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.

C. Panelboards shall be provided with copper ground busses.

D. Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.

2.4 OVERCURRENT DEVICES

A. Overcurrent devices shall be trip-free molded case, bolt-on, thermal magnetic circuit breakers.

B. Main circuit breakers shall be individually mounted and bolted to bus assembly. Back-fed branch mounted circuit breakers are prohibited.

C. Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.

D. Ground fault circuit breakers shall require no more panel space than standard breakers.

E. Where circuit breakers are used for switching of lighting, circuits type "SWD" circuit breakers shall be provided.

F. All connections shall be rated for 75°C copper conductors.

PART 3 - EXECUTION

3.1 PANELBOARDS

A. Panelboards shall be installed in accordance with Section 16050, Installation of Electrical Equipment.

END OF SECTION 16470

SECTION 16490

SAFETY SWITCHES

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010 General Requirements for Electrical Work apply to the Work of this Section.

1.2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA KS-1	Enclosed Switches
UL 98	Enclosed and Deadfront Switches

1.3 SUBMITTALS

A. Manufacturer's product data sheets.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

Cutler-Hammer
General Electric
Siemens
Square D

PART 2 - PRODUCTS

2.1 Safety switches shall be 600 VAC, NEMA heavy duty, horsepower rated, visible blade type. Switches shall be non-fused or fused as indicated on the Drawings.

2.2 The switch operating mechanism shall be spring activated quick make - quick break.

2.3 The external operating handle shall indicate the switch position, ON in the up position, OFF in the down position and shall be padlockable in the OFF position. A defeatable interlock shall be provided to prevent opening the cover when the switch is ON and prevent closing the switch contacts when the cover is opened.

2.4 Switches shall be provided with arc suppressors and line terminal shields.

2.5 Single speed motors shall be provided with three pole switches. Two speed motors shall be provided with six pole switches.

2.6 Switches shall be provided with a factory supplied ground kit.

2.7 Fused switches shall be provided with class J fuses. Dual element fuses shall be used in fused disconnects for motors.

2.8 Safety switches installed indoors shall be provided with NEMA 1 enclosures. Safety switches installed outdoors or in wet areas shall be provided with NEMA 3R or 4 enclosures.

PART 3 - EXECUTION

3.1 Safety switches shall be installed in accordance with Section 16050, Installation of Electrical Equipment.

END OF SECTION 16490

SECTION 16500

INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 GENERAL

A. Provisions of Section 16010 General Requirements for Electrical Work, Section 16060 Installation of Wire and Cable, and Section 16110 Raceway and Fittings apply to the work of this section.

1. 2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

CBM Labels	Certified Ballast Manufacturers Assoc.
NEC Art. 410	National Electrical Code
FCC, Part 18	RFI and EMI
ANSI C62.41	Line Transient Protection
UL 1570	Fluorescent Lighting Fixtures
UL 1572	HID Lighting Fixtures
UL 1571	Incandescent Lighting Fixtures
UL 924	Emergency Lighting and Power Equipment
UL 1088	Temporary Lighting

1.3 SUBMITTALS

A. Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals will be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

B. Submit on a separate sheet for each HID and fluorescent fixture type specified, the ballast manufacturer, type and technical data for that ballast.

C. Submit on a separate sheet for each light fixture specified, the proposed lamp and manufacturer's data for that lamp.

1.4 MANUFACTURERS

A. Provide products of the manufacturers specified on the contract drawings and as listed under Part 2 of this section.

1.5 CONTROL

A. Open area over book stacks - Ultrasonic motion sensor controlled.

B. Perimeter - Ambient light sensor controlled.

C. Group Study, Work areas, Offices, Tel/Data Closets, Storage Closets - Passive Infrared wall switch with auto-off switch.

D. Core area around elevator including corridors - Normal circuit lighting will be ultrasonic motion sensor controlled. Emergency circuit lighting will be controlled with a key switch.

E. Toilets - Dual technology (Ultrasonic and Passive Infrared) motion sensor.

F. Electronic Classroom Seminar Room and Events space - Lighting will be controlled with wall toggle and/or dimmer switches.

G. Osher Storage and Special Collections - Standard wall switches will enable the ceiling mounted ultrasonic motion sensors to control. UV filtering lamps or lamps with UV filtering sleeves will be required.

PART 2 - PRODUCTS

2.1 GENERAL

A. Light fixtures shall be provided with housings, trims, ballasts, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation.

B. Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with NEC Article 410, Paragraph 24.

C. Deliver interior lighting fixtures in factory fabricated containers and wrapping, which properly protect fixtures from damage.

D. Store interior lighting fixtures in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.

E. Fixtures installed in ceilings, suspended from ceilings or on walls shall have a plastic film covering protecting lens, louver and lamps from dust, dirt and debris. Plastic film shall not be removed until construction is completed.

2.2 FLUORESCENT FIXTURES

A. General: Provide fluorescent fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings.

B. Fluorescent-Lamp Ballasts: Provide low-energy solid state fluorescent lamp ballasts, operating lamps with a frequency of >20KHz and capable of operating lamp types indicated. Ballasts must be high power factor >0.90, Class A sound rating. Ballasts shall have lamp current crest factor of 1.7 or less and total harmonic distortion less than 20%. Ballasts must be UL listed, Class P, and meet FCC 47CFR Part 18 Non-Consumer and meet applicable ANSI standard.

1. Ballasts that operate T8 lamps shall have the following requirements:
   a. Ballast factor shall be 0.88 – 0.90
   b. Ballast shall be instant start for maximum efficiency and parallel wired such that if one lamp fails, the remaining lamps stay lit.
   c. Ballast must be capable of 0 starting.

C. Manufacturers: Subject to compliance with the requirements, provide ballasts by one of the following:

1. Osram Sylvania Inc.
2. Advance
3. Magnetek

D. Fluorescent Dimming Ballasts: Provide solid state electronic dimming ballasts, capable of operating lamp, types specified, with high power factor rapid start, and Class A sound rating. Ballast shall have a lamp crest factor of 1.7 and below and a total harmonic distortion not to exceed 20%.

1. Manufacturers: Subject to compliance with requirements provide dimming ballasts by one of the following:

   a. Lutron Electronics Co., Inc.
   b. Osram Sylvania, Inc.

E. Compact Fluorescent Ballast: Provide high power factor ballast capable of operating lamp types specified.

2.3 LAMPS

A. Provide fluorescent lamps of types as indicated on the contract drawings. Acceptable lamp manufacturers are Osram Sylvania, Inc. and Philips Lighting Co. Fluorescent lamps shall be 3500K, with a minimum CRI of 82.

B. UV Lamps. Where UV lamps are required they shall be comprised of a single lamp and filter combination or an approved filter sleeve made from virgin polycarbonate. UV lamp/filter combinations or approved filter sleeves shall be clear and filter a minimum 94% of UVA, 100% of UVB and 100% of UVC. Acceptable manufacturers for the lamp/filter combination are Osram Sylvania, Inc. or an approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine all areas and conditions under which lighting fixtures are to be installed and structure which will support lighting fixtures. Notify the Contractor in writing of any conditions which are detrimental to proper installation and completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Coordinate light fixture installations with other trades. Fluorescent light fixtures should be installed at least two feet away from smoke detectors. Coordinate all lighting fixtures with mechanical piping and duct work to allow for proper clearance.

3.2 INSTALLATION

A. Install all lighting fixtures at locations and heights indicated, in accordance with the architectural reflected ceiling plans.

B. All recessed lighting fixtures installed in ceiling which require a fire resistance rating shall be installed in accordance with the 1999 BOCA National Building Code.

C. Provide fixtures and/or fixture outlet boxes with hangers, channel or other method of fastening and supporting fixtures required for proper installation.

D. All pendant mounted fixtures shall be installed plumb and level or as detailed on the Contract Drawings. Pendant mounted type "A", "A2", and "A3" fixtures shall utilize aircraft cable.

E. Tighten connectors and terminals, including screws and bolts in accordance with equipment manufacturer's published torque tightening values for equipment connectors. All screws and bolts shall have washers.

3.3 SPLICES AND TERMINATIONS

A. Twist on wire connectors shall be installed which utilize square-wire spring grips and thermo plastic shells. Install connectors to meet the manufacturer's torquing requirements. Install wire connectors of size required as not to exceed the manufacturers UL-listed CSA recognized wire combinations.

3.4 FIELD QUALITY CONTROL

A. At date of substantial completion, all lamps which are not functioning, have color deficiencies, or are noticeably dimmed shall be replaced with new lamps as determined by the Engineer.

B. All lamps used for temporary lighting in new light fixtures shall be replaced with new lamps.

C. All light fixtures shall be cleaned of dirt and debris upon completion of construction. All finger prints and smudges shall be cleaned.

D. All installed fixtures during remainder of construction shall be protected in accordance with Section 2.1 Paragraph E of this specification section.

E. All light fixtures shall be grounded in accordance with article 250 and 410 of the NEC. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

F. All light fixtures damaged in shipping or during installation shall be replaced with new fixtures at no cost to the Owner.

G. Furnish stock or replacement lamps amounting to 15%, but no less than six lamps, of each type and size lamp used in each type of lighting fixture. Deliver replacement stock as directed to Owner's storage space.

END OF SECTION 16500

SECTION 16540

INTERIOR TRANSFORMERS

PART 1 - GENERAL

1.1 GENERAL

A. The provisions of Section 16010 General Requirements for Electrical Work apply to the Work of this Section.

1. 2 CODES AND STANDARDS

A. Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ANSI C89.2	Dry Type Transformer for General Applications
UL 1561	Dry Type General Purpose and Power Transformers

1.3 SUBMITTALS

A. Manufacturer's product data sheets indicating weights, dimensions, voltage, kVA, impedance ratings, efficiency at 25, 50, 75, and 100 percent load, rated temperature rise, sound level rating and insulation system.

1.4 MANUFACTURERS

A. Subject to compliance with the Specification requirements.

Cutler-Hammer
General Electric
Square D

PART 2 - PRODUCTS

2.1 GENERAL

A. Interior transformers shall be of the sizes, and ratings shown on the Drawings.

B. Transformers shall be general purpose dry type, self-cooled. Transformers 9 kVA and smaller shall be non-ventilated, unless otherwise noted on the Drawings. Transformers 15 kVA and larger shall be ventilated.

C. Transformer sound levels shall meet NEMA/ANSI standard requirements, measured in accordance with ANSI standards. Provide integral vibration and noise dampening supports.

D. Transformers 15 kVA and larger shall have 220 degrees C insulation system with temperature rise not exceeding 115 degrees C under full-rated load in maximum ambient of

40 degrees C. Transformers less than 15 kVA shall have 180 degrees C insulation with a 115 degrees C temperature rise.

E. Provide transformers with 6 full capacity taps, 2 at 2-1/2% above rated primary voltage and 4 at 2-1/2% below rated primary voltage.

PART 3 - EXECUTION

3.1 INSTALLATION AND TESTING

A. Transformers shall be installed in accordance with Section 16050 Installation of Electrical Equipment.

B. Check primary and secondary connections for correctness.

C. Check secondary neutral for proper bonding to ground.

D. Perform one minute megger tests of the primary windings to ground with the secondary grounded and secondary windings to ground with the primary grounded.

E. After transformer is energized, check secondary voltage and adjust taps as necessary.

END OF SECTION 16540