

PROJECT MANUAL

FOR

ELEVATOR ADDITION UNION COUNTY COURTHOUSE MORGANFIELD, KENTUCKY

GREEN RIVER AREA DEVELOPMENT DISTRICT COMMUNITY DEVELOPMENT BLOCK GRANT UNITED STATES DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

> OWNER: UNION COUTY FISCAL COURT 100 WEST MAIN STREET MORGANFIELD, KENTUCKY 42437

> > AUGUST 1, 2022







Elevator Addition Union County Courthouse 100 West Main Street Morganfield, Kentucky

PFGW File No. 1906 BFW File No. 19190 Marcum Engineering File No. 19598



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Elevator Addition Union County Courthouse 100 West Main Street Morganfield, Kentucky

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DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM.....

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SECTION 000115 – DRAWING INDEX

LIST OF DRAWINGS

Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Bidding Drawings, dated October 8, 2019, as modified by subsequent Addenda and Contract modifications.

List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

	COVER SHEET
DA1.0	DEMOLITION PLANS – LEVELS 0 AND 1
DA1.1	DEMOLITION PLANS – LEVELS 2 AND 3
DA1.2	DEMOLITION PLAN – LEVEL 4
S0.1	STRUCTURAL LEAD SHEET
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- 15. Certificate of Owner's Attorney
- 16. General Conditions Table of Contents
- 17. General Conditions Including Federal Labor Standards
- 18. Supplemental General Conditions Including Equal Opportunity Provisions

The contract document must include all the items contained in the bid package as well as an executed contract, bid proposal, executed contractor certifications and executed bond and insurance forms.

Elevator Addition Union County Courthouse Morganfield, Kentucky

1. GENERAL INFORMATION

Description of Project

Union County Courthouse Architectural Barrier Removal Project

Location (Recipient)

Union County Fiscal Court 100 West Main Street Morganfield, KY 42437

List of Contracts

General Construction

Grant No.

21-004

Architect:

Peck Flannery Gream Warren, Inc. P.O. Box 510 101 South 4th Street Paducah, Kentucky 42002-0510

Elevator Addition Union County Courthouse Morganfield, Kentucky

2. ADVERTISEMENT FOR BIDS

Project No.: <u>21-004</u>

Owner: Union Count Fiscal Court

100 West Main Street

Morganfield, KY 42437

Separate sealed bids for Union County Courthouse Architectural Barrier Removal Project will be received by <u>WEDNESDAY</u>, AUGUST 23, 2022, at the Union County Fiscal Court Chambers at the Union County Courthouse, 100 West Main Street, Morganfield, Kentucky, until <u>2:00 PM CST</u>, and then at said office publicly opened and read aloud.

The project involves all labor, materials, equipment, tools and services necessary to install a new passenger elevator within the existing Union County Courthouse.

The project to be constructed and pursuant to this Contract will be financed with assistance from the Kentucky Community Development Block Grant Program and is subject to all applicable Federal laws and regulations.

A Bid bond or certified check for a value of not less than five percent (5%) of the Bidder's total bid amount, including all alternatives bids items and other items as noted. The guarantee shall be made out to: Union County Fiscal Court, Kentucky.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, address, and the name of the project for which the bid is submitted. Only the original Form of Proposal is required, no additional copies are required.

If a bidder wishes to mail a bid, it should be mailed to Union County Fiscal Court, 100 West Main Street, Morganfield, Kentucky, 42437 to the attention of Judge/Executive Adam O'Nan. If bid is mailed, it must be received prior to the bid time and date noted. Facsimile bids will NOT be allowed. Bids received after the deadline will not be opened. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified.

A mandatory pre-bid meeting will be conducted on <u>FRIDAY</u>, <u>AUGUST 12</u>, 2022, at <u>10:00 AM</u> <u>CST</u> at the Project Site.

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Elevator Addition Union County Courthouse Morganfield, Kentucky

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

Union County Courthouse 100 West Main Street Morganfield, KY 42437

PFGW Architects 101 South 4th Street Paducah, Kentucky 42002-0510

Green River Area Development District 300 GRADD Way Owensboro KY 42301 https://gradd.com/open-solicitations/

River City Printing, LLC. 222 Kentucky Ave Paducah, Kentucky

2 separate checks for \$37.50 each are required for each set of bidding documents payable to Union County Fiscal Court—one refundable, one non-refundable. A non-refundable charge of \$25 will be charged for shipping of plan sets, payable to River City Printing, LLC. Deposit and shipping checks shall be mailed to River City Printing, LLC; 222 Kentucky Ave., Paducah, Kentucky 42003, phone (270) 557-7837. Documents will be available on or after <u>Thursday</u>, August 4, 2022. Partial plan sets and specifications will not be available.

Plans may be viewed at www.rivercityprintingllc.com and questions regarding viewing may be directed to River City Printing.

The owner reserves the right to waive any informalities or to reject any or all bids. Each bidder must deposit his bid, security in the amount, form and subject to the conditions provided in the Information for Bidders.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246 and Title VI Minority bidders are encouraged to bid.

No bidder may withdraw his bid within thirty (30) days after the actual date of the opening thereof.

AUGUST 3, 2022 (Date)

"EQUAL EMPLOYMENT OPPORTUNITY"

3. INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The Union County Fiscal Court (herein called the "Owner"), invites bids on the form attached hereto, all blanks If which must be appropriately filled in. Bids will be received by the Owner at the office of Union County Judge Executive, 100 West Main Street, Morganfield, Kentucky 42437, until two (2) o'clock p.m., CST, TUESDAY, AUGUST 23, 2022, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Union County Judge Executive at 100 West Main Street, Morganfield, Kentucky 42437 and designated as bid for <u>Union County Elevator Project</u>.

The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within thirty (30) days after the date of the opening thereof.

2. <u>Preparation of Bid:</u> Each bid must be submitted on the prescribed form and accompanied by Certification of Bidder Regarding Equal Employment Opportunity, Form 950.1; Certification of Bidder (Contractor) Concerning Labor Standards and Prevailing Wage Requirements, Form 1421; Certification of Bidder Regarding Section 3 and Segregated Facilities: and Contractor Eligibility Certification Regarding Debarment, Suspension and Other Responsibilities. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

- 3. <u>Subcontracts:</u> The bidder is specifically advised that any person, for, or other party to whom it is proposed to award a subcontract under this contract:
 - a. Must be acceptable to the Owner and have current eligibility status for federal programs; and
 - b. Must submit Form 950.2, Certification by Proposed Subcontractor Regarding Equal Employment Opportunity, Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities, and Subcontractor Eligibility Certification Regarding Debarment, Suspension and Other Responsibilities. Approval of the proposed subcontract award cannot be given by the Owner unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject. Although the bidder is not required to attach such Certifications by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

- 4. <u>Telegraphic/Facsimile Modification:</u> Any bidder may modify his/her bid by telegraphic or facsimile communication at any time prior to the scheduled closing time for receipt of bids, provided such communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic/facsimile modification over the signature of the bidder was mailed prior to the closing time. The communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed bid is opened. If written confirmation is received within two days from the closing time, no consideration will be given to the telegraphic/facsimile modification.
- 5. <u>Method of Bidding:</u> The Owner invites the following bid(s):

General Contractors for the construction of a new four-stop, machine room-less passenger elevator inside the existing Union County Courthouse. Work includes concrete masonry unit shaft and minor renovations of spaces immediately adjacent to the new elevator shaft.

- 6. <u>Qualifications of Bidder:</u> The Owner may make such investigations as s/he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.
- 7. <u>Bid Security</u>: Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the Bid Bond Form attached hereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such cash, checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or if no award has been made within 30 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he/she has not been notified of the acceptance of his/her bid.
- 8. <u>Liquidated Damages for Failure to Enter into Contract:</u> The successful bidder, upon his/her failure or refusal to execute and deliver the contract and bonds required within 10 days after s/he has received notice of the acceptance of his/her bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid.
- 9. <u>Time of Completion and Liquidated Damages:</u> Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete- the project within three hundred (300) consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of \$250 for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

- 10. <u>Conditions of Work:</u> Each bidder must inform him/herself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all material and labor necessary to carry out the provisions of his/her contract. Insofar as possible, the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.
- 11. <u>Addenda and Interpretations:</u> No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to Jeff Canter, Project Architect, at <u>ieff@pfgw.net</u> and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

- 12. <u>Security for Faithful Performance:</u> Simultaneously with his/her delivery of the executed contract, the contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.
- 13. <u>Power of Attorney:</u> Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
- 14. <u>Notice of Special Conditions:</u> Attention is particularly called to those parts of the contract documents and specifications which deal with the following:
 - a. Inspection and testing of materials.
 - b. Insurance requirements.
 - c. Wage rates.
 - d. Stated allowances.
- 15. <u>Laws and Regulations:</u> The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written in full.
- 16. <u>Method of Award Lowest Qualified Bidder:</u> If at the time this contract is to be awarded, the lowest base bid submitted by a responsible bidder does not exceed

the amount of funds then estimated by the Owner as available to finance the contract, the contract will be awarded on the base bid only. If such bid exceeds such amount, the Owner may reject all bids or may award the contract on the base bid combined with such deductible alternates applied in numerical order in which they are listed in the Form of Bid, as produces a net amount which is within the available funds. If all bids exceed funds available to finance the contract once all deductive alternatives have been applied, the owner may enter into negotiations with the three (3) lowest bidders. The only factor subject to negotiation, however, is price.

- 17. <u>Obligation of Bidder:</u> 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 examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his/her bid.
- 18. <u>Safety Standards and Accident Prevention</u>: With respect to all work performed under this contract, the contractor shall:
 - a. Comply with the safety standards provisions of applicable Laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register", Volume 36, No.75, Saturday, April 17, 1971.
 - b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
 - c. Maintain at his/her office or other well-known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

4. BID BOND FORM

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

as Principal, and	
as Surety, are hereby held and firmly bound unto	as
owner in the penal sum of	for the payment of which,
well and truly to be made, we hereby jointly and several	lly bind ourselves, our heirs,
executors, administrators, successors and assigns. Sig	gned this day of
, 20 .	- •

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

Now, THEREFOR,

- (a.) If said Bid shall be rejected, or in the alternate.
- (b.) If said Bid 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 Bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid

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 obligations of said Surety, and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; 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 hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal

Surety

SEAL

By:

5. BID FOR LUMP SUM CONTRACTS

	Place
	Date
	Project No
Proposal of (a (State)	(hereinafter called "Bidder") corporation/ a partnership/ an individual doing business as (STRIKE OUT INAPPLICABLE TERMS))
To the	
	(hereinafter called "Owner")
Parties:	
The Bidder, in compliance	with your invitation for bids for the construction of a

Having examined the plans and specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposal project including the availability of materials and labor, hereby processes to furnish all labor, materials, and supplies, and to construct the project in accordance with the contract documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the contract documents of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project within ______ consecutive calendar day thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages, the sum of \$______ for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

Bidder acknowledges receipt of the following addendum:

BASE PROPOSAL: Bidder aggress to perform all of the ____

work described in the specifications and shown on the plans for the sum of ______ (\$

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

ALTERNATE PROPOSALS:

PFGW File No. 1906

BFW File No. 19190

Marcum File No. 19598

Alternate No. 1:	
Deduct the sum of	(\$)
Alternate No. 2:	
Deduct the sum of	(\$)
Alternate No. 1:	
Deduct the sum of	(\$)
Alternate No. 1:	
Deduct the sum of	(\$)

UNIT PRICES:

For changed quantities of work items from those indicated by the contract drawings upon written instructions from the architect/engineer, the following unit prices shall prevail:

1	\$
2	\$
3	\$

The above unit prices shall include labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for. Changes shall be processed in accordance with paragraph 17 (a) of the General Conditions.

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

The bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Paragraph 29 of the General Conditions. The bid security attached in the sum of

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

Respectfully submitted:

Ву _____

(Signature)

(SEAL – if bid is by a corporation)

(Title)

(Business Address and Zip Code)

6. CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

Instructions

This certification is required pursuant to Executive Order 11246 (30 F.R. 12319-25). The Implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause, and if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

For contracts over \$10,000, the Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract. The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

	Certification by Bidder			
Na	Name and Address of Bidder (include zip code)			
1.	Bidder has participated in a Clause.	previous contract	or subcontract subject to the Equal Opportunity	
	Yes	No		
2.	Compliance reports were rec Yes	quired to be filled i No	n connection with such contract or subcontract.	
3.	Bidder has filed all complian Employment Utilization Repo	ce reports due un ort (257)	der applicable instructions, including Monthly	
	Yes	No	None Required	

4.	Have you ever been or are you bein	ng considered for sanction due to violation of Executive	Э
	Order 11246, as amended?		
	Yes	No	

No

5. Bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained.

Name and Title of Signer (please type)

Signature

7. CERTIFICATION OF BIDDER REGARDING SECTION 3

Name of Prime Contractor

Project Name

Project Number

The undersigned hereby certifies that:

- a) Section 3 provisions are included in the Contract.
- b) A Contractor Section 3 Plan was prepared and submitted as part of the bid proceedings (if bid exceeds \$100,000).

Name & Title of Signer (print or type)

Signature

8. CONTRACTOR SECTION 3 PLAN (If bid exceeds \$100,000)

agrees to implement the following specific

(Name of Contractor)

affirmative action steps directed at increasing the utilization of lower income residents and businesses within the County of Union.

- A. To ascertain from the locality's CDBG program official the exact boundaries of the Section 3 covered project area and where advantageous, seek the assistance of local officials in preparing and implementing the Section 3 Plan.
- B. To attempt to recruit from within the city the necessary number of lower income residents through: Local advertising media, signs placed at the proposed site for the project, and community organizations and public or private institutions operating within or serving the project area such as Service Employment and Redevelopment (SER), Opportunities Industrialization Center (OIC), Urban League, Concentrated Employment Program, Hometown Plan, or the U.S. Employment Service.
- C. To maintain a list of all lower-income residents who have applied either on their own or on referral from any source, and to employ such persons, if otherwise eligible and if a vacancy exists.
- D. To insert this Section 3 plan in all bid documents, and to require all bidders on subcontracts to submit a Section 3 plan including utilization goals and the specific steps planned to accomplish these goals. *
- E. To insure that subcontract which are typically let on a negotiated rather than a bid basis in areas other than Section 3 covered project areas, are also let on a negotiated basis, whenever feasible, when let in a Section 3 covered project area. *
- F. To formally contact unions, subcontractors and trade associations to secure their cooperation for this program.
- G. To insure that all appropriate project area business concerns are notified of pending subcontractual opportunities.
- H. To maintain records, including copies of correspondence, memoranda, etc., which document that all of the above affirmative action steps have been taken.
- I. To appoint or recruit an executive official of the company or agency as Equal Opportunity Officer to coordinate the implementation of this Section 3 plan.
- J. To list on Table A, information related to subcontracts to be awarded.
- K. To list on Table B, all projected workforce needs for all phases of this project by occupation, trade, skill level and number of positions.

^{*} Loans, grants, contracts and subsidies for \$100,000 or less are exempt.

As officers and representatives of _____

(Name of Contractor)

We the undersigned have read and fully agree to this Section 3 Plan, and become a party to the full implementation of this program.

Signature

Title

Date

Signature

Title

CONTRACTOR SECTION 3 PLAN (continued)

TABLE A PROPOSED SUBCONTRACTS BREAKDOWN FOR THE PERIOD COVERING ______through ______ (Duration of the CDBG-Assisted Project)

Column 1	Column 2	Column 3	Column 4	Column 5
TYPE OF CONTRACT (BUSINESS OR PROFESSION)	TOTAL NUMBER OF CONTRACTS	TOTAL APPROXIMATE DOLLAR AMT.	ESTIMATED NO. OF CONTRACTS TO SECTION 3 BUSINESSES*	ESTIMATE DOLLAR AMT. TO SECTION 3 BUSINESSES

* A Section 3 business is: one that is owned by Section 3 residents (low and very low income residents of the project area, public housing residents or persons with disabilities); one that employs Section 3 residents; or one that subcontracts to businesses that provide opportunities for low and very low income residents.

The Project Area is coextensive with the City/County of ______'s boundaries.

Company

Project Name

Project Number

EEO Officer-Signature

CONTRACTOR SECTION 3 PLAN (continued)

TABLE B ESTIMATED PROJECT WORKFORCE BREAKDOWN

Column 1	Column 2	Column 3	Column 4	Column 5
JOB CATEGORY	TOTAL ESTIMATED POSITIONS	NO. POSITIONS CURRENTLY OCCUPIED BY PERMANENT EMPLOYEES	NO. POSITIONS NOT CURRENTLY OCCUPIED BY PERMANENT EMPLOYEES	NO. POSITIONS TO BE FILLED WITH SECTION 3 RESIDENTS*
OFFICERS SUPERVISORS				
PROFESSIONALS				
TECHNICIANS				
HOUSING SALES RENTAL/MANAGEMENT				
OFFICE CLERICAL				
SERVICE WORKERS				
OTHERS				

TRADE:

JOURNEYMEN		
HELPERS		
APPRENTICES		
MAXIMUM NO. TRAINEES		
OTHERS		

TRADE:

JOURNEYMEN		
HELPERS		
APPRENTICES		
MAXIMUM NO. TRAINEES		
OTHERS		

TRADE:

JOURNEYMEN		
HELPERS		
APPRENTICES		
MAXIMUM NO. TRAINEES		
OTHERS		

* Section 3 residents include low and very low income persons who live in the project area, public housing residents and persons with disabilities.

Elevator Addition Union County Courthouse Morganfield, Kentucky

Company

Project Name

Project Number

EEO Officer-Signature

9. CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

Name of Prime Contractor	Project Number		
Instructions			
This certification is required pursuant to Executive Order 11246 (30 F.R. 12319-25). The Implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause, and if so, whether it has filed all compliance reports due under applicable instructions. Where the certification indicates that the subcontractor has not filed a compliance report due under applicable instructions, such subcontractor shall be required to submit a compliance report before the owner approves the subcontract or parmite work to begin under the subcontract.			
For subcontracts over \$10,000, the Subcontractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes. The Subcontractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract. The Subcontractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity			
Subcontractor's Certifica	tion		
Name and Address of Subcontractor (include zip code)			
Subcontractor has participated in a previous contract or a Opportunity Clause. Yes No	subcontract subject to the Equal		
2. Compliance reports were required to be filled in connective Yes No	ion with such contract or subcontract.		
 Subcontractor has filed all compliance reports due under Monthly Employment Utilization Report (257) Yes No 	r applicable instructions, including None Required		

4.	Have you ever been or are you bein Order 11246, as amended?	g considered f	or sanction due	to violation of I	Executive
	Yes	No			

No

5. Bidder certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained.

Name and Title of Signer (please type)

Signature

10. CERTIFICATION OF PROPOSED SUBCONTRACTOR REGARDING SECTION 3

Name of Subcontractor

Project Name

Project Number

The undersigned hereby certifies that:

- (a) Section 3 provisions are included in the Contract.
- (b) A written Section 3 plan was prepared and submitted as part of the bid proceedings (if bid exceeds \$100,000).

Name & Title of Signer (print or type)

Signature

11. CONTRACTOR'S CERTIFICATION CONCERNING LABOR STANDARDS AND PREVAILING WAGE REQUIREMENTS

CONTRACTOR'S CERTIFICATION CONCERNING LABOR STANDARDS AND PREVAILING WAGE REQUIREMENTS

TO (/	Appropr	riate Recipient):	DATE	
C/O			PROJECT NUMBER (if any)	
			PROJECT NAME	
1.	The undersigned, having executed a contract with for the construction of the above identified project, acknowledges that:			
	(a) (b) (c)	The Labor Standards provisions are included in the Prevailing wage requirements are followed, inclu Federal or State wage rate by labor classification. Correction of any infractions of the aforesaid cond any of his subcontractors and any lower tier subcon	e aforesaid contract; ding paying the higher of the ditions, including infractions by ntractors, is his responsibility.	
2.	He ce (a)	 He certifies that: (a) Neither he nor any firm, partnership or association in which he has substantial interest is designated as an ineligible contractor by the Comptroller of the United States pursuant to Section 5.6(b) of the Regulations of the Secretary of Labor., Part 5 (29 CFR, Part 5) or pursuant to Section 3(a) of the Davis-Bacon Act, as amended (40 U.S. C. 276a-2(a)). 		
	(b) No part of the aforementioned contract has been or will be subcontracted to any subcontractor if such subcontractor or any firm, corporation, partnership or association in which such subcontractor has a substantial interest is designed as an ineligible contractor pursuant to any of the aforementioned regulatory or statutory provisions.			
3.	He agrees to obtain and forward to the aforementioned recipient within ten days after execution of any subcontract, including those executed by his subcontractors and lower tier subcontractors, a Subcontractor's Certification Concerning Labor Standa and Prevailing Wage Requirements executed by the subcontractors.		cipient within ten days after the by his subcontractors and any Concerning Labor Standards ntractors.	
4.	He ce	ertifies that:		
	(a)	The legal name and the business address of the ur	ndersigned are:	

(b) The undersigned is:

(1) A S	SINGLE	PROPRIETORSHIP	(3) A CORPO STATE OF:	RATION ORGANIZED IN THE	
(2) A F	PARTNE	RSHIP	(4) OTHER OI (Describe)	(4) OTHER ORGANIZATION (Describe)	
	(c)	The name, title and addrea are:	ss of the owner, partne	ers, or officers of the undersigned	
		NAME	TITLE	ADDRESS	
	(d) The names and address having a substantial inte (if none, so state)		s of all other persons, st in the undersigned,	both natural and corporate, and the nature of the interest are	
	NAME		ADDRESS	NATURE OF INTENT	
	(e)	The names, addresses an contractors in which under	d trade classifications rsigned ha a substanti	of all other building construction al interest (if none, so state):	
		NAME	ADDRESS	TRADE CLASSIFICATION	
	Date_			(Contractor)	
			Ву:	· · · ·	
			<u>WARNING</u>		

U.S. Criminal Code, Section 1010, Title 18, U.S. C., provides in part: "Whoever makes, passes, utters, or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

12. CONTRACT FORM

THIS AGREEMENT, made this County Fiscal Court, Herein called "Owne (Corporate Name of Owner)	day of r,"	, 20, by and bet	ween Union
herein through its			, and
STRIKE OUT (a corporation) (INAPPLICABLE (an individual doing busir TERMS	a partnership) ness as		
of, County of hereinafter called "Contractor"		, and State of	

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

hereinafter called the project, for the sum of ______ Dollars (\$_____) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his (its or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by Union County Fiscal Court, herein entitled the Architect/Engineer, and as enumerated in Paragraph 1 of the Supplemental General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in written "Notice to Proceed" of the OWNER and to fully complete the project within three hundred (300) consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of \$250 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 19 of the General Conditions.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract, and to make payments on account thereof as provided in Paragraph 25, "Payments to Contractor," of the General Conditions.

IN WITNESS WHEREOF, the parties to these presents have executed this contract in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal) ATTEST

(Owner)

 By

 (Witness)
 (Title)

 (Seal)
 (Contractor)

 (Secretary)
 By

 (Vitness)
 (Title)

(Address and Zip Code)

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

Construction project bids estimated to exceed \$25,000 must include bidder security. An acceptable form of bidder security is a bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his/her bid, execute such contractual documents as may be required within the time specified.

Construction contracts or subcontracts exceeding \$25,000 must include:

- a. <u>A performance bond on the part of the contractor for 100 percent of the contract</u> <u>price as it may be increased.</u> A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
- b. <u>A payment bond on part of the contractor for 100 percent of the contract price.</u> A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.

14. CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned,	,	the	duly	authorized	and
acting legal representative of				,	do

hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Signature

Date

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15. GENERAL CONDITIONS Table of Contents

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- 3. Additional Instructions and Details Drawings
- 4. Shop or Setting Drawings
- 5. Materials, Services and Facilities
- 6. Contractor's Title to Materials
- 7. Inspection and Testing of Materials
- 8. "Or Equal" Clause
- 9. Copyrights and Patents
- 10. Surveys, Permits and Regulations
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16. GENERAL CONDITIONS Including Federal Labor Standards Provisions

1. Contract and Contractor Documents

The project to be constructed and pursuant to this Contract will be financed with assistance from the Kentucky Community Development Block Grant Program and is subject to all applicable Federal laws and regulations.

The plans, specifications and addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions on page 30, shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. Definitions

The following terms as used in this contract are respectively defined as follows:

- (a) "Contractor": A person, firm or corporation with whom the contract is made by the Owner.
- (b) "Subcontractor": A person, firm or corporation supplying labor and materials or only labor for work at the site of the project for, and under separate contract or agreement with, the Contractor.
- (c) "Work on (at) the project": Work to be performed at the location of the project, including the transportation of materials and supplies to or from the location of the project by employees of the Prime Contractor and any Subcontractor.
- 3. Additional Instructions and Detail Drawings

The Contractor will be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the Contract Documents and will be so prepared that they can be reasonably interpreted as part thereof. The Contractor shall carry out the work in accordance with the additional detail drawings and instructions. The Contractor and the Architect/Engineer will prepare jointly (a) a schedule, fixing the dates at which special detail drawings will be required, such drawings, if any, to be furnished by the Architect/Engineer in accordance with said schedule, and (b) a schedule fixing the respective dates for the submission of show drawings, the beginning of manufacture, testing and installation of materials, supplies and equipment, and the completion of the various parts of the work; each such schedule to be subjected to change from time to time in accordance with the progress of the work.

4. Shop or Setting Drawings

The Contractor shall submit promptly to the Architect/Engineer two copies of each shop or setting drawing prepared in accordance with the schedule predetermined as aforesaid. After examination of such drawings by the Architect/Engineer and the return thereof, the Contractor shall make such corrections to the drawings as have been indicated and shall furnish the Architect/Engineer with two corrected copies. If requested by the Architect/Engineer the Contractor must furnish additional copies. Regardless of corrections made in or approval given to such drawings by the Architect/Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the plans and specifications, unless he notifies the Architect/Engineer in writing of any deviations at the time he furnishes such drawings.

- 5. Materials, Services and Facilities
 - (a) It is understood that except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, superintendence, temporary construction of every nature and all other services and facilities of every nature whatsoever necessary to execute, complete and deliver the work within the specified time.
 - (b) Any work necessary to be performed after regular working hours, on Sunday or Legal Holidays, shall be performed without additional expense to the Owner.
- 6. Contractor's Title to Materials

No materials or supplies for the work shall be purchased by the Contractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. The Contractor warrants that he has good title to all materials and supplies used by him in the work, free from all liens, claims or encumbrances.

- 7. Inspection and Testing of Materials
 - (a) All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Owner. The Owner will pay for all laboratory inspection service direct, and not as a part of the Subcontract.
 - (b) Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.

8. "Or Equal" Clause

Whenever a material, article or piece of equipment is identified on the plans or in the specifications by reference to manufacturers' or vendors' names, trade names, catalogue numbers, etc., it is intended merely to establish a standard; and, any materials, article or equipment of other manufacturers and vendors which will perform adequately to the duties imposed by the general design will be considered equally acceptable provided the material, article or equipment so proposed, is, in the opinion of the Architect/Engineer, of equal substance and function. It shall not be purchased or installed by the Contractor without the Architect/Engineer's written approval.

- 9. Copyrights and Patents
 - (a) The Contractor shall hold and save the Owner and its officers, agents, servants and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatended invention, process, article or appliance manufactured or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.
 - (b) License or Royalty Fees: License and/or royalty fees for the use of a process which is authorized by the Owner of the project must be reasonable, and paid to the holder of the patent, or his authorized licensee, direct by the Owner and not by or through the Contractor.
 - (c) If the contractor uses any design, device or materials covered by letters, patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. If is mutually agreed and understood, that without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any say involved in the work. The Contactor and/or his Sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this Contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.
 - (d) Any copyrightable work resulting from this Agreement is available to the author for such, but the City and the Department of Local Government reserve the option for unlimited use and license to such work. Any discovery or invention shall be reported promptly to the City and the Department of Local Government for the determination as to whether

patent protection should be sought and how the rights of any patent shall be disposed of and administered in order to protect the public interest.

10. Surveys, Permits and Regulations

Unless otherwise expressly provided for in the specifications, the Owner will furnish the Contractor all surveys necessary for the execution of the work.

The Contractor shall procure and pay all permits, licenses and approvals necessary for the execution of this Subcontract.

The Contractor shall comply with all laws, ordinances, rules, orders and regulations relating to performance of the work, the protection of adjacent property and the maintenance of passageways, guard fences or other protective facilities.

11. Contractor's Obligations

The Contractor shall and will, in good workmanlike manner, do and perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this Contract, within the time herein specified, in accordance with the provisions of this Contract and said specifications and in accordance with the plans and drawings covered by this Contract any and all supplemental plans and drawings, and in accordance with the directions of the Contractor and/or Architect/Engineer as given from time to time during the progress of the work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required.

The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements and limitations of the Contract and specifications, and shall do, carry on and complete the entire work to the satisfaction of the Contractor, Architect/Engineer and the Owner.

12. Weather Conditions

In the event of temporary suspension of work, or during inclement weather, or whenever the Architect/Engineer shall direct, the Contractor will, and will cause his Subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Architect/Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to protect his work, such materials shall be removed and replaced at the expense of the Contractor.

13. Protection of Work and Property – Emergency

The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Contract. He shall at all times safely guard and protect his own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury unless such be caused directly by errors contained in the Contract or by the Owner, or his duly authorized representatives.

In case of an emergency which threatens loss or injury of property, and/or safety of life, the Contractor will be allowed to act, without previous instructions from the Architect/Engineer, in a diligent manner. He shall notify the Architect/Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted to the Architect/Engineer for approval.

Where the Contractor has not taken action but has notified the Architect/Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Architect/Engineer.

The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Paragraph 17 of the General Conditions.

14. Inspection

The authorized representatives and agents of the Department of Local Government and the Department of Housing and Urban Development shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials and other relevant data and records.

15. Reports, Records and Data

The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this Contract.

16. Superintendence by Contractor

At the site of the work the Contractor shall employ a construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Architect/Engineer and shall be one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.

17. Changes in Work

No changes in the work covered by the approved Contract Documents shall be made without having prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:

(a) Unit bid prices previously approved.

- (b) An agreed lump sum.
- (c) The actual cost of
 - 1. Labor, including foremen.
 - 2. Materials entering permanently into the work.
 - 3. The ownership or rental cost of construction plant and equipment during the time of use on the extra work.
 - 4. Power and consumable supplies for the operation of power equipment.
 - 5. Insurance.
 - 6. Social Security and old age and unemployment contributions.

18. Extras

Without invalidating the Contract, the Owner may order extra work or make changes by altering, adding to or deducting from the work, the contract sum being adjusted accordingly, and the consent of the Surety being first obtained where necessary or desirable. All the work of the kind bid upon shall be paid for at the price stipulated in the proposal, and no claims for any extra work or materials shall be allowed unless the work is ordered in writing by the Owner or its Architect/Engineer, acting officially for the Owner, and the price is stated in such order.

19. Time for Completion and Liquidated Damages

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this Contract; and it is further mutually understood and agreed that the work embraced in this Contract shall be commended on a data to be specified in the "Notice to Proceed".

The Contractor agrees that said work shall be prosecuted regularly, diligently and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the Contractor for completing the work.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.

It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. <u>Provided</u>, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; <u>provided</u>, <u>further</u>, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

- (a) To any preference, priority or allocation order duly issued by the Government.
- (b) To unforeseeable cause beyond the control and without fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and severe weather.
- (c) To any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article.

<u>Provided</u>, <u>further</u>, that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain in the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter.

20. Correction of Work

All work, all materials, whether incorporated in the work or not, all processes of manufacture, and all methods of construction shall be at all times and places subject to the inspection of the Architect/Engineer who shall be the final judge of the quality and suitability of the work, materials, processes of manufacture and methods of construction for the purposes for which they are used. Should they fail to meet his approval they shall be forthwith reconstructed, made good, replaced and/or corrected, as the case may be, by the Contractor at his own expense. Rejected materials shall immediately be removed from the site. If, in the opinion of the Architect/Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as in the judgment of the Architect/Engineer shall be equitable.

21. Subsurface Conditions Found Different

Should the Subcontractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the plans or indicated in the specifications, he shall immediately give notice to the Architect/Engineer of such conditions before they are disturbed. The Architect/Engineer will thereupon promptly investigate the conditions, and if he finds that they materially differ from those shown on the plans or indicated in the specifications he will at once make such changes in the plans and/or specifications as he may find necessary, any increase or decrease of cost resulting from such changes to be adjusted in the manner provided in Paragraph 17 of the General Conditions.

22. Claims for Extra Cost

No claim for extra work or associated cost shall be allowed unless the same was done in pursuance of a written order of the Architect/Engineer approved by the Owner, as aforesaid and the claim presented with the first estimate after the changed or extra work is done. When work is performed under the terms of subparagraph 17(c) of the General Conditions, the Subcontractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

23. Right of Owner to Terminate Contract

In the event that any of the provisions of this Contract are violated by the Contractor, or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and the Surety of its intention to terminate the Contract, such notices to contain the reasons for such intention to terminate the Contract, and unless within ten (10) days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement of correction be made, the Contract shall, upon the expiration of said ten (10) days, cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the Surety and the Contractor and the Surety shall have the right to take over and perform the Contract; provided, however, that if the Surety does not commence performance thereof within ten (10) days from the date of the mailing to such Surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and his Surety shall be liable to the Owner for any excess cost occasioned by the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances and plant as may be on the site of the work and necessary therefore.

The Owner may terminate this Contract at any time by giving at least ten (10) days notice in writing to the Contractor. If the Contract is terminated by the Owner as provided herein, the Contractor will be paid for the time provided and expenses incurred up to the termination date. If the Contract is terminated due to the fault of the Contractor, the above paragraph relative to termination shall apply. 24. Construction Schedule and Periodic Estimates

Immediately after execution and delivery of the Contract, and before the first partial payment is made, the Contractor shall deliver to the Owner an estimated construction progress schedule in form satisfactory to the Owner, showing the proposed dates of commencement and completion of each of the various subdivisions of work required under the Contract Documents and the anticipated amount of each monthly payment will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish on forms to be supplied by the Owner (a) a detailed estimate giving a complete breakdown of the contract price and (b) periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the contract price.

- 25. Payments to the Contractor
 - (a) Not later than the 30th day of each calendar month the Owner shall make a progress payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this Contract, but to insure the proper performance of this Contract, the Owner shall retain ten percent (10%) of the amount of each estimate until final completion and acceptance of all work covered by this Contract; provided, that the Contractor shall submit his estimate not later than the 15th day of the month; provided, further, that on completion and acceptance of each separate building, public work, or other division of the Contract, on which the price is stated separately in the Contract, payment may be made in full, including retained percentages thereon, less authorized deductions.
 - (b) In preparing estimates the material delivered on the site and preparatory work done may be taken into consideration.
 - (c) All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the Contract.
 - (d) <u>Owner's Right to Withhold Certain Amounts and Make Application Thereof:</u> The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen. mechanics, materialmen and furnishers of machinery and parts thereof, equipment, power tools and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged or waived. If the Contractor fails to do so, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct,

or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety .In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the Contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

26. Acceptance of Final Payment Constitutes Release

The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor for all things done or furnished in connection with this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his Sureties from any obligations under this Contract or the performance and payment bond.

27. Payments by Contractor

The Contractor shall pay (a) for all transportation and utility services not later than the ______day of the calendar month following that in which services are rendered, (b) for all materials, tools and other expendable equipment to the extent of ninety percent (90%) of the cost thereof, not later than the ____ day of the calendar month following that in which such materials, tools and equipment are delivered at the site of the project, and the balance of the cost thereof, not later than the ___day following the completion of that part of the work in or on which such materials, tools and equipment are incorporated or used, and (c) to each of his Subcontractors, not later than the ___day following each payment to the Contractor, the respective amount allowed the Contractor on account of the work performed by his Subcontractors to the extent of each Subcontractor's interest therein.

28. Insurance

The Contractor shall not commence work under this Contract until he has obtained all the 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 this subcontract until the insurance required of the Subcontractor has been so obtained and approved.

(a) <u>Compensation Insurance:</u> The Contractor shall procure and shall maintain during the life of this Contract Workmen's Compensation Insurance as required by applicable State or territorial law for all of his employees to be engaged in work at the site of the project under this Contract, and, in case of any such work sublet, the Contractor shall require the Subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this Contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

- (b) <u>Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance:</u> The Contractor shall procure and maintain during the life of this Contract Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the amounts specified in Supplemental General Conditions.
- (c) <u>Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance</u>: The Contractor shall either (1) require each of his Subcontractors to procure and to maintain during the life of his subcontract Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in the Supplemental General Conditions specified in subparagraph (B) hereof, or (2) insure the activities of his policy, specified in subparagraph (b) hereof.
- (d) Scope of Insurance and Special Hazards: The insurance required under subparagraphs (b) and (c) hereof shall provide adequate protection for the Contractor and his Subcontractors, respectively, against damage claims which may arise from operations under this Contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this Contract as enumerated in the Supplemental General Conditions.
- (e) <u>Builder's Risk Insurance (Fire and Extended Coverage)</u>: Until the project is completed and accepted by the Owner, the Owner or Contractor (at the Owner's option as indicated in the Supplemental General Conditions. Form HUD-4238-N) is required to maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portion of the project for the benefit of the Owner, the Contractor, and Subcontractors as their interests may appear. The Contractor shall not include any costs for Builder's Risk Insurance (fire and extended coverage) premiums during construction unless the Contractor is required to provide such insurance, however, this provision shall not release the Contractor from his obligation to complete, according to plans and specifications, the project covered by the Contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.
- (f) <u>Proof of Carriage of Insurance:</u> The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled or materially altered, except after ten (10) days written notice has been received by the Owner."

29. Contract Security

The Contractor shall furnish a performance bond in an amount at least equal to one hundred percent (100%) of the contract prices as security for the faithful performance of this Contract and also a payment bond in an amount not less than one hundred percent (100%) of the contract price or in a penal sum not less than that prescribed by State, territorial or local law, as security for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The performance bond and the payment bond may be in one or in separate instruments in accordance with local law.

30. Additional or Substitute Bond

If at any time the Owner for justifiable cause shall be or become dissatisfied with any Surety or Sureties, then upon the performance or payment bonds, the Contractor shall within five (5) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other Surety or Sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new Surety or Sureties shall have furnished such an acceptable bond to the Owner.

31. Assignments

The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the corporations of services rendered or materials supplied for the performance of the work called for in this contract.

32. Mutual Responsibility of Contracts

If, through acts of neglect on the part of the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

33. Separate Contracts

The Contractor shall coordinate his operations with those of other Contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractor, including his Subcontractors, shall keep informed of the progress and the detail work of other Contractors and shall notify the Architect/Engineer immediately of lack of progress or defective workmanship on the part of other Contractors. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress of defective workmanship by others shall be construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

34. Subcontracting

- (a) The Contractor may utilize the services of specialty Subcontractors on those parts of the work which, under normal contracting practices, are performed by specialty Subcontractors.
- (b) The Contractor shall not award any work to any Subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the Subcontractor, which statement shall contain such information as the Owner may require.
- (c) The Contractor shall be as fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.
- (d) The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.
- (e) Nothing contained in this Contract shall create any contractual relation between any Subcontractor and the Owner.
- 35. Architect/Engineer's Authority

The Architect/Engineer shall give all orders and directions contemplated under this contract and specifications, relative to the execution of the work. The Architect/Engineer shall determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this Contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Architect/Engineer's estimates and decisions shall be final and conclusive, except as herein otherwise expressly provided. In case any question shall arise between the parties hereto relative to said Contract and specifications, the determination or decision of the Architect/Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this Contract affected in any manner or to any extent by such question.

The Architect/Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found obscure or be in dispute. Any differences or conflicts in regard to their work which may arise between the Contractor under this Contract and other Contractors performing work for the Owner shall be adjusted and determined by the Architect/Engineer.

36. Stated Allowances

The Contractor shall include in his proposal the cash allowances stated in the Supplemental General Conditions. The Contractor shall purchase the "Allowed Materials" as directed by the Owner on the basis of the lowest and best bid of at least three competitive bids. If the actual price for purchasing the "Allowed Materials" is more or less than the "Cash Allowance," the contract price shall be adjusted accordingly. The adjustment in contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation of the "Allowed Materials" shall be included in the applicable sections of the Contract Specifications covering this work.

37. Use of Premises and Removal of Debris

The Contractor expressly undertakes at his own expense:

- (a) To take every precaution against injuries to persons or damage to property.
- (b) To store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other Contractors.
- (c) To place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.
- (d) To clean up frequently all refuse, rubbish, scrap materials and debris caused by his operations, to the end that at all times the site of the work shall present a neat, orderly and workmanlike appearance.
- (e) Before final payment to remove all surplus material, false-work, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition.
- (f) To effect all cutting, fitting or patching of his work required to make the same to conform to the plans and specifications and, except with the consent of the Architect/Engineer, not to cut or otherwise alter the work of any other Contractor.
- 38. Quantities of Estimate

Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the work contemplated by this Contract, and such increase or diminution shall in no way vitiate this Contract, nor shall any such increase or diminution give cause for claims or liability for damages.

39. Lands and Rights-of-Way

Prior to the start of construction, the Owner shall obtain lands and rights-of-way necessary for the carrying out and completion of work to be performed under this Contract.

40. General Guaranty

Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of final acceptance of the work unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.

41. Conflicting Conditions

Any provisions in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in these General Conditions shall be void to the extent of such conflict or inconsistency.

42. Notice and Service Thereof

Any notice to any Contractor from the Owner relative to any part of this Contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted, by certified or registered mail, to the said Contractor at his last given address or delivered in person to the said Contractor or his authorized representative on the work.

43. Provisions Required by Law Deemed Inserted

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

44. Protection of Lives and Health

"The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes, in addition to specific safety and health regulations described by Chapter XIII, Bureau of Labor Standards, Department of Labor, Part 1518, Safety and Health Regulations for Construction, as outlined in the Federal Register, Volume 36, No.75, Saturday, April 17, 1971. Title 29 - Labor shall be observed and the Contractor shall take or cause to be taken, such additional safety and health measures as the Contracting Authority may determine to be reasonably necessary."

45. Subcontracts

"The Contractor will insert in any subcontracts the Federal Labor Standards Provision contained herein and such other clauses as the Department of Housing and Urban Development may, by instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made."

46. Conflict of Interest

No person who is an employee, agent, consultant, officer or elected or appointed official of recipient or subrecipient who exercises or has exercised any functions or responsibilities with respect to KCDBG activities or who is in a position to participate in a decision making process or gain inside information with regard to such activities may obtain a financial interest or benefit from a KCDBG activity, have an interest or benefit from the activity or have an interest in any contract, subcontract or agreement with respect to a CDBG activity or its proceeds, for themselves or those with whom they have family or business ties. The prohibition applies during their tenure and for one year thereafter.

47. Interest of Member of or Delegate to Congress

No member of or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.

48. Other Prohibited Interests

No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract or any other contract pertaining to the project.

49. Use and Occupancy Prior to Acceptance by Owner

The Contractor agrees to use and occupancy of a portion or unit of the project before formal acceptance by the Owner, provided the Owner:

- (a) Secures written consent of the Contractor except in the event, in the opinion of the Architect/Engineer, the Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other Contract requirements.
- (b) Secures endorsement from the insurance carrier and consent of the surety permitting occupancy of the building or use of the project during the remaining period of construction.

Or

(c) When the project consists of more than one building, and one of the buildings is occupied, secures permanent fire and extended coverage

insurance, including a permit to complete construction. Consent of Surety must also be obtained.

50. Photographs of the Project

If required by the Owner, the Contractor shall furnish photographs of the project, in the quantities and as described in the Supplemental General Conditions.

51. Suspension of Work

Should the Owner be prevented or enjoined from proceeding with work either before or after the start of construction by reason of any litigation or other reason beyond the control of the Owner, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay; but time for completion of the work will be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay with such determination to be set forth in writing.

52. Access to Records

The Contractor shall maintain accounts and project records, including personnel, property and financial records, adequate to identify and account for all costs pertaining to the Contract and such other records as may be deemed necessary by the City/County to assure proper accounting for all project funds, both CDBG and non-CDBG shares. These records will be made available to the City, the Department of Local Government, Commonwealth of Kentucky Finance & Administration Cabinet, Commonwealth of Kentucky Auditor of Public Audits, Commonwealth of Kentucky Legislative Research Commission, U.S. Department of Housing and Urban Development, the U. S. Department of Labor, and the Comptroller General of the United States, or any of their duly authorized representatives. These parties shall have access to any books, documents, papers and records of the Contractor which are directly pertinent to the project, for the purpose of making audit, examination, excerpts, and transcriptions. All records shall be maintained for five years after project closeout.

53. Federal Labor Standards Provisions (HUD-401 0,2-84)

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A.1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made

a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1 (b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321 shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- 1. The work to be performed by the classification requested is not performed by a classification in the wage determination;
- 2. The classification is utilized in the area by the construction industry; and
- 3. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U. S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(b) or (c) of the paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding, HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal Contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and Basic Records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a

period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project). Such records shall contain the name, address and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1 (b)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b)(2)(B) of Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U. S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under 0MB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a 'Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

- 1. That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;
- 2. That each laborer or mechanic (including each helper 1 apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from

the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3.

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph A.3(ii)(b) of this section.

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 and Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph A.3(i) of this section available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant 20 CFR Part 5.12.

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

(ii) Trainees, Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U. S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

- 5. Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.
- 6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clause contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or

its designee may be appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

- 7. Contract Termination; Debarment. A breach of contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 CFR Part 5.12.
- 8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1,3, and 5 are herein incorporated by reference in this contract.
- 9. Disputes Concerning Labor Standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U. S. Department of Labor, or the employees or their representatives.
- 10. (i) Certification of Eligibility .By entering into this contract, the contractor certified that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No pan of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis- Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C.1001. Additionally, U. S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions," provides in part: "Whoever, for the purpose of ...influencing in any way the action of such Administration ...makes, utters, or publishes any statement, knowing the same to be false ...shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

- 11. Complaints, Proceedings, or Testimony by Employees.
 - (a) No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under Contract to his employer.
 - B. Contract Work Hours and Safety Standards Act (over \$100,000). As used in this paragraph, the terms "laborers' and "mechanics" include watchmen and guards.

- Overtime Requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- 2. Violation; Liability For Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.
- 3. Withholding For Unpaid Wages and Liquidated Damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federallyassisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.
- 4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.
- C. Health and Safety

- (1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
- (2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly Part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96).
- (3) The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.
- 54. Anti-Kickback Act

Attachment to Federal Labor Standards Provisions, So-Called "Anti-Kickback Act" and Regulations Promulgated Pursuant Thereto by the Secretary of Labor. United States Department of Labor. Title 18, U.S.C., Section 874 (HUD-4010, 2-76) (Replaces section 1 of the Act of June 13, 1934 (48 Stat. 948, 40 U.S.C., Section 276B) pursuant to the Act of June 25, 1948, 62 Stat. 862).

Kickbacks from Public Works Employees

Whoever, by force, intimidation, or threat of procuring dismissal from employment, or by any other manner whatsoever induces any person employed in the construction, prosecution, completion or repair of any public building, public work, or building or work financed in whole or in part by loans or grants from the United States, to give up any part of the compensation to which he is entitled under his contract of employment, shall be fined not more than \$5,000 or imprisoned not more than five years, or both.

Section 2 of the Act of June 13, 1934, as amended (48 Stat. 948, 62 Stat. 862,63 Stat. 108, Stat. 967, 40 U.S.C., section 276c).

The Secretary of Labor shall make reasonable regulations for contractors and subcontractors engaged in the construction, prosecution, completion or repair of buildings, public works or buildings or works financed in whole or in part by loans or grants from the United States, including a provision that each contractor shall furnish weekly a statement with respect to the wages paid each employee during the preceding week. Section 1001 of Title 18 (United States Code) shall apply to such statements.

Pursuant to the aforesaid Anti-Kickback Act, the Secretary of Labor, United States Department of Labor, has promulgated the regulations hereinafter set forth, which regulations are found in Title 29, Subtitle A, Code of Federal Regulations, Part 3. The term "this part", as used in the regulations hereinafter set forth, refers to Part 3 last above mentioned. Said regulations are as follows.

Title 29 – Labor; Subtitle A – Office of the Secretary of Labor, Part 3 – Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in part by loans or grants from the United States.

Section 3.1 – Purpose and scope

This part prescribes "anti-kickback" regulations under section 2 of the Act of June 13, 1934, as amended (40 U.S.C. 276c), popularly known as the Copeland Act. This part applies to any contract which is subject to Federal wage standards and which is for the construction, prosecution, completion, or repair of public buildings, public works or buildings or works financed in whole or in part by loans or grants from the United States. The part is intended to aid in the enforcement of the minimum wage provisions of the Davis-Bacon Act and the various statutes dealing with Federallyassisted construction that contain similar minimum wage provisions, including those provisions which are not subject to Reorganization Plan No.14 (e.g., the College Housing Act of 1950, the Federal Water Pollution Control Act, and the Housing Act of 1959), and in the enforcement of the overtime provisions of the Contract Work Hours Standards Act whenever they are applicable to construction work. The part details the obligation of contractors and subcontractors relative to the weekly submission of statements regarding the wages paid on work covered thereby; sets forth the circumstances and procedures governing the making of payroll deductions from the wages of those employed on such work; and delineates the methods of payment permissible on such work.

Section 3.2 – Definitions.

As used in the regulations in this part:

(a) The terms "building" or "work" generally include construction activity as distinguished from manufacturing, furnishing of materials, or servicing and maintenance work. The terms include, without limitation, buildings, structures, and improvements of all types, such as bridges, dams, plants, highways, parkways, streets, subways, tunnels, sewers, mains, power lines, pumping stations, railways, airports, terminals, docks, piers, wharves, ways, lighthouses, buoys, jetties, breakwaters, levees, and canals; dredging, shoring, scaffolding, drilling, blasting, excavating, clearing, and landscaping. Unless conducted in connection with and at the site of such a building or work as is described in the foregoing sentence, the manufacture or furnishing of materials, articles, supplies, or equipment (whether or not a Federal or State agency acquires title to such materials, articles, supplies, or equipment during the course of the manufacture or furnishing, or owns the materials from which they are manufactured or furnished) is not a "building" or "work" within the meaning of the regulations in this part.

- (b) The terms "construction", "completion," or "repair' mean all types of work done on a particular building or work at the site thereof, including, without limitation, altering, remodeling, painting and decorating, the transporting of materials and supplies to or from the building or work by the employees of the construction contractor or construction subcontractor, and the manufacturing or furnishing of materials, articles, supplies, or equipment on the site of the building or work, by persons employed at the site by the contractor or subcontractor.
- (c) The terms "public building" or "public work" include building or work for whose construction, prosecution, completion, or repair, as defined above, a Federal agency is a contracting party, regardless of whether title thereof is in a Federal agency.
- (d) The term "building or work financed in whole or in part by loans or grants from the United States" includes building or work for whose construction, prosecution, completion, or repair, as defined above, payment or part payment is made directly or indirectly from funds provided by loans or grants by a Federal agency. The term does not include building or work for which Federal assistance is limited solely to loan guarantees or insurance.
- (e) Every person paid by a contractor or subcontractor in any manner for his labor in the construction, prosecution, completion, or repair of a public building or public work or work financed in whole or in part by loans or grants from the United States is "employed" and receiving "wages," regardless of contractual relationship alleged to exist between him and the real employer.
- (f) The term "any affiliated person" includes a spouse, child, parent, or other close relative of the contractor or subcontractor; a partner or officer of the contractor or subcontractor; a corporation closely connected with the contractor or subcontractor as parent, subsidiary or otherwise, and an officer or agent of such corporation.
- (g) The term "Federal agency" means the United States, the District of Columbia, and all executive departments, independent establishments, administrative agencies, and instrumentalities of the United States and of the District of Columbia, including corporations. all or substantially all of the stock of which is beneficially owned by the United States, by the District of Columbia, or any of the foregoing departments, establishments, agencies and instrumentalities.

Section 3.3 – Weekly statement with respect to payment of wages

- (a) As used in this section, the term "employee" shall not apply to persons in classifications higher than that of laborer or mechanic and those who are the immediate supervisors of such employees.
- (b) Each contractor or subcontractor engaged in the construction, prosecution, completion, or repair of any public building or public work, or building or work financed in whole or in part by loans or grants from the United States, shall furnish each week a statement with respect to the wages paid each of its employees engaged on work covered by 29 CFR Parts 3 and 5 during the preceding weekly payroll period. This statement shall be executed by the contractor or subcontractor or by an authorized officer or employee of the contractor or subcontractor who supervises the payment of wages and shall

be on form WH 348, "Statement of Compliance," or on an identical form on the back of WH 347, "Payroll (For Contractors Optional Use)" or on any form with identical wording. Sample copies of WH 347 and WH 348 may be obtained from the Government contracting or sponsoring agency, and copies of these forms may be purchased at the Government Printing Office.

- (c) The requirements of this section shall not apply to any contract of \$2,000 or less.
- (d) Upon a written finding by the head of a Federal agency, the Secretary of Labor may provide reasonable limitations, variations, tolerances and exemptions from the requirements of this section subject to such conditions as the Secretary of Labor may specify.

(29 F.R. 95, Jan. 4 1964, as amended at 33 FR 10186, July 17, 1968)

Section 3.4 – Submission of weekly statements and the preservation and inspection of weekly payroll records.

- (a) Each weekly statement required under SS 3.3 shall be delivered by the contractor or subcontractor within seven days after the regular payment date of the payroll period, to a representative of a Federal or State agency in charge at the site of the building or work, or, if there is no representative of a Federal or State agency at the site of the building or work, the statement shall be mailed by the contractor or subcontractor, within such time, to a Federal or State agency contracting for or financing the building or work. After such examination and check as may be made, such statement, or a copy thereof, shall be kept available, or shall be transmitted together with a report of any violation, in accordance with applicable procedures prescribed by the United States Department of Labor.
- (b) Each contractor or subcontractor shall preserve his weekly payroll records for a period of three years from date of completion of the contract. The payroll records shall set out accurately and completely the name and address of each laborer and mechanic, his correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid. Such payroll records shall be made available at all times for inspection by the contracting officer or his authorized representative, and by authorized representatives of the Department of Labor.

Section 3.5 – Payroll deductions permissible without application to or approval of the Secretary of Labor.

Deductions made under the circumstances or in the situations described in the paragraphs of this section may be made without application to and approval of the Secretary of Labor.

(a) Any deduction made in compliance with the requirements of Federal, State or local law, such as Federal or State withholding income taxes and Federal social security taxes.

- (b) Any deduction of sums previously paid to the employee as a bona fide prepayment of wages when such prepayment is made without discount or interest. A "bona fide prepayment of wages'. is considered to have been made only when cash or its equivalent has been advanced to the person employed in such manner as to give him complete freedom of disposition of the advanced funds.
- (c) Any deduction of amounts required by court process to be paid to another, unless the deduction is in favor of the contractor, subcontractor or any affiliated person, or when collusion or collaboration exists.
- (d) Any deduction constituting a contribution on behalf of the person employed to funds established by the employer or representatives of employees, or both, for the purpose of providing either from principal or income, or both, medical or hospital care, pensions or annuities on retirement, death benefits, compensation for injuries, illness, accidents, sickness, or disability, or for insurance to provide any of the foregoing, or unemployment benefits. vacation pay, savings accounts, or similar payments for the benefit of employees, their families and dependents: Provided, however, That the following standards are met: (1) The deduction is not otherwise prohibited by law; (2) it is either: (i) Voluntarily consented to by the employee in writing and in advance of the period in which the work is to be done and such consent is not a condition either for the obtaining of or for the continuation of employment, or (ii) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees; (3) no profit or other benefit is otherwise obtained, directly or indirectly, by the contractor or subcontractor or any affiliated person in the form of commission, dividend, or otherwise; and (4) the deductions shall serve the convenience and interest of the employee.
- (e) Any deduction contribution toward the purchase of United States Defense Stamps and Bonds when voluntarily authorized by the employee.
- (f) Any deduction requested by the employee to enable him to repay loans to or to purchase shares in credit unions organized and operated in accordance with Federal and State credit union statutes.
- (g) Any deduction voluntarily authorized by the employee for the making of contributions to governmental or quasi-governmental agencies, such as the American Red Cross.
- (h) Any deduction voluntarily authorized by the employee for the making of contributions to Community Chests, United Givers Funds, and similar charitable organizations.
- (i) Any deductions to pay regular union initiation fees and membership dues, not including fines or special assessments: Provided, however, that a collective bargaining agreement between the contractor or subcontractor and representatives of its employees provides for such deductions and the deductions are not otherwise prohibited by law.
- (j) Any deduction not more than for the "reasonable cost' of board, lodging, or other facilities meeting the requirements of section 3(m) of the Fair Labor Standards Act of 1938, as amended, and Part 431 of this title. When such a deduction is made the additional records required under SS 516.27(a) of this title shall be kept.

Section 3.6 – Payroll deductions permissible with the approval of the Secretary of Labor.

Any contractor or subcontractor may apply to the Secretary of Labor for permission to make any deduction not permitted under SS 3.5. The Secretary may grant permissions whenever he finds that:

- (a) The contractor, subcontractor, or any affiliated person does not make a profit or benefit directly or indirectly from the deduction either in the form of a commission, dividend, or otherwise;
- (b) The deduction is not otherwise prohibited by law;
- (c) The deduction is either (1) voluntarily consented to by the employee in writing and in advance of the period in which the work to be done, and such consent is not a condition either for the obtaining of employment or its continuance, or
 (2) provided for in a bona fide collective bargaining agreement between the contractor or subcontractor and representatives of its employees; and
- (d) The deduction serves the convenience and interest of the employee.

Section 3.7 – Applications for the approval of the Secretary of Labor.

Any application for the making of payroll deductions under SS 3.6 shall comply with the requirements prescribed in the following paragraphs of this section:

- (a) The application shall be in writing and shall be addressed to the Secretary of Labor.
- (b) The application shall identify the contract or contracts under which the work in question is to be performed. Permission will be given for deductions only on specific, identified contracts, except upon a showing of exceptional circumstances.
- (c) The application shall state affirmatively that there is compliance with the standards set forth in the provisions of SS 3.6. The affirmation shall be accompanied by a full statement of the facts indicating such compliance.
- (d) The application shall include a description of the proposed deduction, the purpose to be served thereby, and the classes of laborers or mechanics from whose wages the proposed deduction would be made.
- (e) The application shall state the name and business of any third person to whom any funds obtained from the proposed deductions are to be transmitted and the affiliation of such person, if any, with the applicant.

Section 3.8 – Action by the Secretary of Labor upon applications.

The Secretary of Labor shall decide whether or not the requested deduction is permissible under provisions of SS 3.6; and shall notify the applicant in writing of his decision.

Section 3.9 – Prohibited payroll deductions.

Deductions not elsewhere provided for by this part and which are not found to be permissible under SS 3.6 are prohibited.

Section 3.10 – Methods of payment of wages.

The payment of wages shall be by cash, negotiable instruments payable on demand. or the additional forms of compensation for which deductions are permissible under this part. No other methods of payment shall be recognized on work subject to the Copeland Act.

Section 3.11 – Regulations part of contract.

All contracts made with respect to the construction, prosecution, completion, or repair of any public building or public work or building or work financed in whole or in part by loans or grants from the United States covered by the regulations in this part shall expressly bind the contractor or subcontractor to comply with such of the regulations in this part as may be applicable. In this regard, see SS 5.5(a) of this subtitle.

17. SUPPLEMENTAL GENERAL CONDITIONS Including Equal Opportunity Provisions

- 1. Enumeration of Plans, Specifications and Addenda
- 2. Stated Allowances
- 3. Special Hazards
- 4. Contractor's and Subcontractor's Public Liability, Vehicle Liability and Property Damage Insurance
- 5. Photographs of Project
- 6. Schedule of Occupational Classifications and Minimum Hourly Wage Rates
- 7. Builder's Risk Insurance
- 8. Special Equal Opportunity Provisions
- 9. Certification of Compliance with Air and Water Acts
- 10. Special Conditions Pertaining to Hazards, Safety Standards and Accident Prevention
- 11. Energy Efficiency
- 12. Access to Records
- 13. Wage Rate Determination(s)
- 14. Contract Work Hours and Safety Standards Act
- 15. Enumeration of Plans, Specifications and Addenda

Following are the Plans, Specifications and Addenda which form a part of this Contract, as set forth in paragraph 1 of the General Conditions, "Contract and Contract Documents":

DRAWINGS

General Construction:	Nos. <u>DA1.0; DA1.1; DA1.2; S01.;</u> <u>S1.0; S2.0; S3.0; A1.0; A1.1; A1.2;</u> <u>A2.0; A3.0</u>
Heating and Ventilating:	Nos. <u>M0.1; DM1.1; DM1.2; M1.1;</u> M1.2; ME1.1
Plumbing:	Nos. NONE
Electrical:	Nos. <u>E0.1; E0.2; DE1.1; DE1.2;</u> <u>DE1.3; DE1.4; E1.1; E1.2; E1.3;</u> E1.4; E3.1; E4.1; E4.2; E4.3

SPECIFICATIONS:

General Construction:	Page <u>015000-1</u>	to <u>142123.16-11</u> , inclusive
Heating and Ventilating:	Page <u>23000-1</u>	to <u>233716-2,</u> inclusive
Plumbing:	Page	to, inclusive
Electrical:	Page <u>26000-1</u>	to <u>284621.11-12</u> , inclusive

ADDENDA:

No	Date	No	Date
No	Date	No	Date

16. Stated Allowances

Pursuant to Paragraph 36 of the General Conditions, the Contractor shall include the following cash allowances in his proposal

(a) For	_ (Page	_ of Specifications)	\$
(b) For	_ (Page	_ of Specifications)	\$
(c) For	_ (Page	_ of Specifications)	\$
(d) For	_ (Page	_ of Specifications)	\$
(e) For	_ (Page	_ of Specifications)	\$
(f) For	_ (Page	_ of Specifications)	\$

3. Special Hazards

The Contractor's and his Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against the following special hazards:

4. Contractor's and Subcontractor's Public Liability, Vehicle Liability and Property Damage Insurance As required under paragraph 28 of the General Conditions, the Contractor's Public Liability Insurance and Vehicle Insurance shall be in an amount not less than \$______ for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than \$
on account of one accident, and Contractor's Property Damage Insurance in an amount not less than \$_____.

The Contractor shall either (1) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of the type and in the same amounts as specified in the preceding paragraph, or (2) insure the activities of his Subcontractors in his own policy.

5. Photographs of Project

As provided in paragraph 30 of General Conditions, the Contractor will furnish photographs in the number, type and stage as enumerated below:

6. Schedule of Occupational Classifications and Minimum Hourly Wage Rate as required under paragraph 52 of the General Conditions.

Given on pages 1 thru 8 of Specification Section 007346

7. Builder's Risk Insurance

As provided in the General Conditions, paragraph 28(e), the Contractor will/will not* maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portions of the project for the benefit of the Owner, the Contractor and all Subcontractors, as their interests may appear.

* Strike out one.

- 8. Special Equal Opportunity Provisions
 - A. 3-Paragraph Equal Opportunity Clause for Activities and Contracts Not subject to Executive Order 11246, as Amended (applicable to Federally assisted construction contracts and related subcontracts \$10,000 and under)

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

- The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
- 2. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by contracting

officer setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, or sex or national origin.

- 3. Contractors shall incorporate forgoing requirements in all subcontracts.
- B. Executive Order 11246 (contracts/subcontracts above \$10,000)
 - 1. Section 202 Equal Opportunity Clause

During the performance of this Contract, the Contractor agrees the following:

- a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
- b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration without regard to race, color, religion, sex or national origin.
- c. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the Contract Compliance Officer advising the said labor union or workers' representatives of the Contractor's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor.
- e. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records and

accounts by the Department and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and others.

- f. In the event of the Contractor's non-compliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations or orders, this Contract may be canceled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.
- g. The Contractor will include the provisions of the sentence immediately preceding paragraph a. and the provisions of paragraphs a. through g. in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Department may direct as a means of enforcing such provisions, including sanctions for non-compliance. Provided, however. that in the event a Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Department, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.
- 2. Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) (applicable to contract/subcontracts exceeding \$10,000)
 - a. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications", set forth herein.
 - b. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for Minority	Goals for Female
Participation	Participation
4.7%	6.9%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the Contractor performs construction work in a geographic area located outside of the covered area, it shall apply the goals established for such geographic area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its Federally involved and non-Federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR 60-4 shall be based on its implementation of the Equal Opportunity Clause. Specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goal shall be a violation of the Contract, the Executive Order and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

- c. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the Subcontractor; employer identification number; estimated dollar amount of the subcontract; and the geographical area in which the contract is to be performed.
- d. As used in this notice, and in the contract resulting from the solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county, and city, if any).
- 3. Standard CDBG Assisted Employment Opportunity Construction Contract Specifications (Executive Order 11246)
 - a. As used in these specifications:
 - (1) "Covered area" means the geographical area described in solicitation from which this Contract resulted.

- (2) "Director" means Director, Office of Federal Contract Compliance Program, United States Department of Labor, or any person to whom the Director delegates authority.
- (3) "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
- (4) "Minority" includes:
 - (a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin).
 - (b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race).
 - (c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent or the Pacific Islands.
 - (d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification.
- (5) Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this Contract resulted.
- (6) If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the plan area (including goals and timetables) shall be in accordance with that plan for those trades which have unions participating in the plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure

to take good faith efforts to achieve the plan goals and timetables.

- (7) The Contractor shall implement the specific affirmative action standards provided in paragraphs 10a through p of these specifications. The goals set forth in the solicitation form which this Contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction Contractorsperforming contracts in geographical areas where they do not have a Federal or Federally-assisted construction contract shall apply the minority and female goals established for the geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting, its goals in each craft during the period specified.
- (8) Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women, shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- (9) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U. S. Department of Labor.
- (10) The Contractor shall take specific affirmative actions to ensure equal employment opportunity .The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- (a) Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
- (b) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.
- (c) Maintain a current file of the names, addresses and telephone numbers of each minority and female off- the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
- (d) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- (e) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship

and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 10b above.

- (f) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- (g) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onpersonnel site supervisorv such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed and disposition of the subject matter.
- (h) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- (i) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the

Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship other training or by anv recruitment source, the contractor shall send written notification to organizations such as the above. describing the openings, screening procedures and tests to be used in the selection process.

- (j) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
- (k) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- (I) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- (m) Ensure that seniority practices job classifications work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy under the Contractor's obligations under these specifications are being carried out.
- (n) Ensure that all facilities and company activities are non-segregated except that separate or single-use toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- (o) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

- (p) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- (11) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (10a through p). The efforts of a contractor association, joint contractor-union, contractorcommunity, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 10a through p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation shall not be a defense for the Contractor's non-compliance.
- (12) A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- (13) The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex or national origin.
- (14) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- (15) The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Employment Opportunity Clause, including suspension, termination and cancellation of existing

subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

- (16) The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 10 of these specifications, so as to achieve maximum results from its effor1s to ensure equal employment oppor1unity .If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
- (17) The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
- (18) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).
- C. Certification of Nonsegregated Facilities (over \$10,000)

By the submission of this bid, the bidder, offeror, applicant or subcontractor certifies that s/he does not maintain or provide for his/her employees any segregated facility at any of his/her establishments, and that s/he does not permit employees to perform their services at any location, under his/her control, where segregated facilities are maintained. S/he certifies further that s/he will not maintain or provide for employees any segregated facilities at

any of his/'her establishments, and s/he will not permit employees to perform their services at any location under his/her control where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the Equal Employment Opportunity Clause of this Contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, *transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom or otherwise. S/he further agrees that (except where he/she has obtained identical certifications. from proposed Subcontractors for specific time periods) he/she will obtain identical certification from proposed Subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause; that he/she will retain such certifications in his/her files; and that he/she will forward the following notice to such proposed Subcontractors (except where proposed Subcontractors have submitted identical certifications for specific time periods).

* Parking lots, drinking fountains, recreation or entertainment areas.

D. Title VI Clause, Civil Rights Act of 1964

Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

E. Section 109 Clause, Housing and Community Development Act of 1974

No person in the United States shall on the grounds of race, color national origin or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

- F. "Section 3" Compliance in the Provision of Training, Employment and Business Opportunities (Over \$100,000)
 - 1. The work to be performed under this Contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701 u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given low and very low income residents of the project area (including public housing residents and persons with disabilities) and contracts for work in connection with the project be awarded to business

concerns which are owned by or employee low and very low income residents of the project area.

- 2. The parties to this Contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this Contract. The parties to this Contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.
- 3. The Contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract of understanding, if any, a notice advising the said labor organization or workers' representative of his commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.
- 4. The Contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal financial assistance, take appropriate action pursuant to the subcontract upon a finding that the Subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The Contractor will not subcontract with any Subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 135 and will not let any subcontract unless the Subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.
- 5. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Department issued hereunder prior to the execution of the Contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient for such assistance, its successors and assigns. Failure to fulfill these requirements shall subject the applicant or recipient, its contractors and subcontractors, its successors and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provided, and to such sanctions as are specified in 24 CFR Part 135.
- G. Rehabilitation Act of 1973, Section 503 Handicapped (if \$10,000 or over)

Affirmative Action for Handicapped Workers

1. The Contractor will not discriminate against any employee or applicant for employment because of physical or mental handicap in regard to

any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as the following: employment, upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship.

- 2. The Contractor agrees to comply with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
- 3. In the event of the Contractor's non-compliance with the requirements of this clause, actions for non-compliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
- 4. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notices shall state the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped employees and applicants for employment, and the rights of applicants and employees.
- 5. The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Rehabilitation Act of 1973, and is committed to take affirmative action to employ and advance in employment physical and mentally handicapped individuals.
- 6. The Contractor will include the provisions of this clause in every subcontract or purchase order of \$10,000 or more unless exempted by rules, regulations or orders of the Secretary issued pursuant to Section 503 of the Act, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for non-compliance.
- H. Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended; 41 CFR Part 60-250 (if \$100,000 or over)
 - 1. The contractor will not discriminate against any employee or applicant for employment because he or she is a special disabled veteran or veteran of the Vietnam era in regard to any position for which the employee or applicant for employment is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat

qualified individuals without discrimination based on their status as a special disabled veteran or veteran of the Vietnam era

- i. recruitment, advertising, and job application procedures
- ii. hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff and rehiring;
- iii. rates of pay or any other form of compensation and changes in compensation;
- iv. job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;
- v. leaves of absence, sick leave, or any other leave;
- vi. fringe benefits available by virtue of employment, whether or not administered by the contractor
- vii. selection and financial support for training, including apprenticeship, and on-the-job training under 38 U.S.C 3687, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;
- viii. activities sponsored by the contractor including social or recreational programs; and
- ix. any other term, condition, or privilege of employment.
- 2. The contractor agrees to immediately list all employment openings which exist at the time of the execution of this contract and those which occur during the performance of this contract, including those not generated by this contract and including those occurring at an establishment of the contractor other than the one wherein the contract is being performed, but excluding those of independently operated corporate affiliates, at an appropriate local employment service office of the state employment security agency wherein the opening occurs. Listing employment openings with the U.S. Department of Labor's America's Job Bank shall satisfy the requirement to list jobs with the local employment service office.
- 3. Listing of employment openings with the local employment service office pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and nonveterans. The listing of employment openings does not require the hiring of any particular job applicants or from any particular group of job applicants, and nothing

herein is intended to relieve the contractor from any requirements in Executive orders or regulations regarding nondiscrimination in employment.

- 4. Whenever the contractor becomes contractually bound to the listing provisions in paragraphs 2 and 3 of this clause, it shall advise the state employment security agency in each state where it has establishments of the name and location of each hiring location in the state, provided that this requirement shall not apply to state and local governmental contractors. As long as the contractor is contractually bound to these provisions and has so advised the state agency, there is no need to advise the state agency of subsequent contracts. The contractor may advise the state agency when it is no longer bound by this contract clause.
- 5. The provisions of paragraphs 2 and 3 of this clause do not apply to the listing of employment openings which occur and are filled outside of the 50 states, the District of Columbia, the Commonwealth of Puerto Rico, Guam, and the Virgin Islands.
- 6. As used in this clause:
 - i. All employment openings includes all positions except executive and top management, those positions that will be filled from within the contractor's organization, and positions lasting three days or less. This term includes full-time employment, temporary employment of more than three days' duration, and part-time employment.
 - ii. Executive and top management means any employee:
 - a) Whose primary duty consists of the management of the enterprise in which he or she is employed or of a customarily recognized department or subdivision thereof; and
 - b) who customarily and regularly directs the work of two or more other employees therein; and
 - who has the authority to hire or fire other employees or whose suggestions and recommendations as to the hiring or firing and as to the advancement and promotion or any other change of status of other employees will be given particular weight; and
 - d) who customarily and regularly exercises discretionary powers; and
 - e) who does not devote more than 20 percent, or, in the case of an employee of a retail or service establishment who does not devote as much as 40 percent, of his or her hours of

work in the work week to activities which are not directly and closely related to the performance of the work described in (a) through (d) of this paragraph 6. ii.; Provided, that (e) of this paragraph 6.ii. shall not apply in the case of an employee who is in sole charge of an independent establishment or a physically separated branch establishment, or who owns at least a 20-percent interest in the enterprise in which he or she is employed.

iii. Positions that will be filled from within the contractor's organization means employment openings for which no consideration will be given to persons outside the contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings which the contractor proposes to fill from regularly established ``recall" lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of his or her own organization.

7. The contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.

- 8. In the event of the contractor's noncompliance with the requirements of this clause, actions for noncompliance may be taken in accordance with the rules, regulations, and relevant orders of the Secretary of Labor issued pursuant to the Act.
- 9. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, provided by or through the contracting officer. Such notices shall state the rights of applicants and employees as well as the contractor's obligation under the law to take affirmative action to employ and advance in employment qualified employees and applicants who are special disabled veterans or veterans of the Vietnam era. The contractor must ensure that applicants or employees who are special disabled veterans are informed of the contents of the notice (e.g., the contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair).
- 10. The contractor will notify each labor organization or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the contractor is bound by the terms of the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended, and is committed to take affirmative action to employ and advance in employment qualified special disabled veterans and veterans of the Vietnam era.

- 11. The contractor will include the provisions of this clause in every subcontract or purchase order of \$10,000 or more, unless exempted by the rules, regulations, or orders of the Secretary issued pursuant to the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the Deputy Assistant Secretary for Federal Contract Compliance Programs may direct to enforce such provisions, including action for noncompliance.
- I. Age Discrimination Act of 1975

During the performance of this Contract, the Contractor agrees as follows: the Contractor agrees not to exclude from participation, deny program benefits, or discriminate on the basis of age.

9. Certification of Compliance with Air and Water Acts (applicable to Federally-assisted construction contracts and related subcontracts exceeding (\$100,000)

During the performance of this Contract, the Contractor and all Subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Contract Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended.

In addition to the foregoing requirements, all "nonexempt" Contractors and Subcontractors shall furnish to the Owner, the following:

- A. A stipulation by the Contractor or Subcontractors, that any facility to be utilized in the performance of any nonexempt contract or subcontract, is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.
- B. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
- C. A stipulation that as a condition for the award of the Contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized, or to be utilized for the Contract, is under consideration to be listed on the EPA List of Violating Facilities.
- D. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraphs A through D of this section in every nonexempt subcontract and requiring that the Contractor will take

such actions as the Government may direct as a means of enforcing such provisions.

10. Special Conditions Pertaining to Hazards, Safety Standards and Accident Prevention

A. Lead-Based Paint Hazards (applicable to contracts for construction or rehabilitation of residential structures)

The construction or rehabilitation of residential structures is subject to the HUD Lead-Based Paint regulations, 24 CFR Part 35. The Contractor and Subcontractors shall comply with the provisions for the elimination of lead- based paint hazards under sub-part B of said regulations. The Owner will be responsible for the inspections and certifications required under Section 35.14(f) thereof.

B. Danger Signals and Safety Devices (modify as required)

The Contractor shall make all necessary precautions to guard against damages to property and injury to persons. He shall put up and maintain in good condition, sufficient red or warning lights at night, suitable barricades and other devices necessary to protect the public. In case the Contractor fails or neglects to take such precautions, the Owner may have such lights and barricades installed and charge the cost of this work to the Contractor. Such action by the Owner does not relieve the Contractor of any liability incurred under these specifications or Contract.

11. Energy Efficiency

The Contractor shall recognize mandatory standards and policies relating to energy efficiency, which are contained in the State Energy Conservation Plan issued in Compliance with the Energy Policy and Conservation Act.

12. Access to Records

The Contractor shall maintain accounts and project records, including personnel, property and financial records, adequate to identify and account for all costs pertaining to the Contract and such other records as may be deemed necessary by the City to assure proper accounting for all project funds, both CDBG and non-CDBG shares. These records will be made available to the City, the Department of Local Government, Commonwealth of Kentucky Finance & Administration Cabinet, Commonwealth of Kentucky Auditor of Public Audits, Commonwealth of Kentucky Legislative Research Commission, U.S. Department of Housing and Urban Development, the U. S. Department of Labor, and the Comptroller General of the United States, or any of their duly authorized representatives. These parties shall have access to any books, documents, papers and records of the Contractor, which are directly pertinent to the project, for the purpose of making audit, examination, excerpts and transcriptions. All records shall be maintained for five years after project closeout.

13. Wage Rate Determination(s)

See Specification Section 007346

14. Contract Work Hours and Safety Standards Act

All grantees and subgrantee's contracts must contain provisions requiring compliance with sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 USC 327-330) as supplemented by Department of Labor regulations (29 CFR Part 5) where construction contracts are awarded by grantees or subgrantees in excess of \$2,000, and in excess of \$2,500 for other contracts involving the employment of mechanics and laborers.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Access to site.
 - 4. Coordination with occupants.
 - 5. Work restrictions.
 - 6. Specification and Drawing conventions.
 - 7. Miscellaneous provisions.

1.2 PROJECT INFORMATION

- A. Project Identification: Elevator Addition, Union County Courthouse.
 - 1. Project Location: 100 West Main Street, Morganfield, Kentucky 42437.
- B. Owner: Union County Fiscal Court
 - 1. Owner's Representative: Mr. Sean Sheffer, Director Union County Planning Commission.
- C. Architect: Peck Flannery Gream Warren, Inc. 101 South 4th Street P.O. Box 510 Paducah, Kentucky 42002-0510 Phone: 270-443-8471
- D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1.	Structural Engineer:	BFW Engineering & Testing, Inc.
		500 South 17 th Street
		P.O. Box 120
		Paducah, Kentucky 42002-0120
		Phone: 270-443-1995

2. Mechanical/Electrical: Marcum Engineering, LLC 500 South 17th Street P.O. Box 120 Paducah, Kentucky 42002-0120 Phone: 270-444-9274

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The installation of a new passenger elevator within the existing Union County Courthouse and other Work indicated in the Contract Documents.
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

- A. General: Contractor shall have restricted use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform normal operations of the Union County Courthouse.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.5 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

- 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
- 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: The Owner is open to construction activity being conducted during the hours of 5:30 p.m. to 6.30 a.m. with proper notification to Owner and coordination with Owner occupancy of the building during construction. This does not prohibit work from being conducted during business hours. Coordination of work schedule and hours will be discussed in greater detail at Pre-Construction Meeting to be held after award of contract.
 - 1. Weekend Hours: No work shall be conducted on Sundays.
 - 2. Early Morning Hours: No work shall be conducted prior to 7 a.m. unless approved and coordinated with the Owner.
 - 3. Late Night Hours: No work shall be conducted after 4 p.m. unless approved and coordinated with the Owner.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than three days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than three days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Restricted Substances: Use of tobacco products and other controlled substances shall not be allowed on site.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
- 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.8 MISCELLANEOUS PROVISIONS

A. Refer to Specification Section and Drawings for indication of work phases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request 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 costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

- 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 costs of labor and supervision directly attributable to the change.
- 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 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.

1.3 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use 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 schedule of values consistent with format of AIA Document G703.
 - 3. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
 - 4. 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.

- 5. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
- 6. Overhead Costs: Include total cost and proportionate share of general overhead and profit for each line item.
- 7. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
- 8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
- 9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.4 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
- 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. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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 for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.

- 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
- 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three 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.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
- H. 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. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Products list (preliminary if not final).
 - 5. Schedule of unit prices.
 - 6. Submittal schedule (preliminary if not final).
 - 7. List of Contractor's staff assignments.
 - 8. Copies of building permits.
 - 9. Initial progress report.
 - 10. Report of preconstruction conference.
 - 11. Certificates of insurance and insurance policies.
 - 12. Performance and payment bonds.
 - 13. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues 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 Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706.
 - 5. AIA Document G706A.
 - 6. AIA Document G707.
 - 7. Evidence that claims have been settled.
 - 8. 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.
 - 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. 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, telephone number, and email address 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.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and in prominent location. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall cooperate with Project coordinator who 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 own 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 performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. 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 scheduled activities of other contractors and direction of Project coordinator to avoid conflicts and to ensure orderly progress of the Work.

1.5 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

- 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
- 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.
 - 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 12. Contractor's signature.
 - 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.

- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
- 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Software log with not less than the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.6 PROJECT MEETINGS

- A. General: Architect will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned

parties shall attend the conference. 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. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Procedures for processing field decisions and Change Orders.
 - h. Procedures for RFIs.
 - i. Procedures for testing and inspecting.
 - j. Procedures for processing Applications for Payment.
 - k. Distribution of the Contract Documents.
 - 1. Submittal procedures.
 - m. Preparation of Record Documents.
 - n. Use of the premises.
 - o. Work restrictions.
 - p. Working hours.
 - q. Owner's occupancy requirements.
 - r. Responsibility for temporary facilities and controls.
 - s. Procedures for moisture and mold control.
 - t. Procedures for disruptions and shutdowns.
 - u. Construction waste management and recycling.
 - v. Parking availability.
 - w. Office, work, and storage areas.
 - x. Equipment deliveries and priorities.
 - y. First aid.
 - z. Security.
 - aa. Progress cleaning.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for 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 RFIs.
 - d. Related Change Orders.

- e. Purchases.
- f. Deliveries.
- g. Submittals.
- h. Sustainable design requirements.
- i. Review of mockups.
- j. Possible conflicts.
- k. Compatibility requirements.
- 1. Time schedules.
- m. Weather limitations.
- n. Manufacturer's written instructions.
- o. Warranty requirements.
- p. Compatibility of materials.
- q. Acceptability of substrates.
- r. Temporary facilities and controls.
- s. Space and access limitations.
- t. Regulations of authorities having jurisdiction.
- u. Testing and inspecting requirements.
- v. Installation procedures.
- w. Coordination with other work.
- x. Required performance results.
- y. Protection of adjacent work.
- z. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Architect will schedule and conduct progress meetings at monthly intervals.
 - 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
- 1) Review schedule for next period.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.
 - 11) Quality and work standards.
 - 12) Status of correction of deficient items.
 - 13) Field observations.
 - 14) Status of RFIs.
 - 15) Status of Proposal Requests.
 - 16) Pending changes.
 - 17) Status of Change Orders.
 - 18) Pending claims and disputes.
 - 19) Documentation of information for payment requests.
- 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list.
 - 3. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

- 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
- 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.
 - 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Indication of full or partial submittal.
 - 13. Location(s) where product is to be installed, as appropriate.
 - 14. Other necessary identification.
 - 15. Remarks.
 - 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on

previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

- D. Paper Submittals:
 - 1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
 - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
 - 4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 - 5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using transmittal form.
- E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.5 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 - 2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 - 3. Paper: Prepare submittals in paper form, and deliver to Architect.
- 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. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

- 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections 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. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. 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 published data are unsuitable 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 catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
 - a. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

- 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
- 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
- 4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
- 5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
- 6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
- 7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

1.7 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp or indication in web-based Project software. Include 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. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.8 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
 - 3. Submittals by Web-Based Project Software: Architect will indicate, on Project software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will discard submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.
- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
 - 1. Methods used to meet the goals and requirements of the Owner.
 - 2. Concrete cutting method(s) to be used.
 - 3. Location of construction devices on the site.
 - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 - 6. Indicate locations of sensitive equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.4 QUALITY ASSURANCE

- A. 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.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flamespread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

- 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
- 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
- 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with fourstage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 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 by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

- 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Temporary 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 that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped airfiltration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dustproducing equipment. Isolate limited work within occupied areas using portable dustcontainment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filterequipped vacuum equipment.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide a portable cellular telephone for superintendent's use in making and receiving telephone calls.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Utilize designated area within existing building for temporary field offices.
 - 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel. Coordinate with Owner.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs. Coordinate with Owner.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Elevator Use: See Division 14 elevator Section for temporary use of new elevators.

- J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided 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 stairs become damaged, restore damaged areas, so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- D. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- H. 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 incomplete, insulate temporary enclosures.
- I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
 - 1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 3. Insulate partitions to control noise transmission to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Protect air-handling equipment.
 - 6. Provide walk-off mats at each entrance through temporary partition.
- J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -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.
 - 4. 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.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 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.
 - 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.
- C. Temporary Facility Changeover: 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 property of Contractor. Owner reserves right to take possession of Project identification signs.
- 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
 - 2. Section 01770 "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Products: Items obtained 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. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, inservice performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

- 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 - 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

- 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
- 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
- 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

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 and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 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 determine compliance with the Contract Documents and that products are undamaged and properly protected.
- C. Storage:
 - 1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
 - 2. Store products to allow for inspection and measurement of quantity or counting of units.
 - 3. Store materials in a manner that will not endanger Project structure.

- 4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
- 5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
- 4. Where products are accompanied by the term "as selected," Architect will make selection.
- 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- 6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.
- B. Product Selection Procedures:
 - 1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
 - 2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
 - 3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
 - 4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

- 5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
- 6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
- 7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
 - 1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 - 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.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 - 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch 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.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or 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.

- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.
- B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
- 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and/or Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

- 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
- 2. Establish limits on use of Project site.
- 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
- 4. Inform installers of lines and levels to which they must comply.
- 5. Check the location, level and plumb, of every major element as the Work progresses.
- 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. 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.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.

- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.

- 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 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. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Application for Payment and Substantial and Final Completion.
 - 2. Section 017300 "Execution" for progress cleaning of Project Site.
 - 3. Divisions 2 through 16 for specific closeout and special cleaning requirements for products in those sections.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at final completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 - 6. Advise Owner of changeover in utility services.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

- 9. Complete final cleaning requirements.
- 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. 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. 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.

1.6 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
 - 5. Submit final completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization 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.

- 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.
- 4. Submit list of incomplete items in the following format:
 - a. PDF electronic file. Architect will return annotated file.
 - b. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).
 - c. Three paper copies. Architect will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit by email to Architect.
- D. Warranties in Paper Form:
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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 designated 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 not planted, mulched, or 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.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.

- 1. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- p. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
- 2. Section 017300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of stairs.
 - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. All office furniture and furnishings.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs or video and templates.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
 - 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies. Coordinate with Owner.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 **PROTECTION**

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and

finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

- 1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from <u>lower to higher</u> level. Complete selective demolition and shoring operations below each floor or tier before disturbing supporting members on the next level.
 - 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. Use hand tools 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 fire watch during and for at least two hours after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.
 - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 10. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:

- 1. Clean and repair items to functional condition adequate for intended reuse.
- 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
- 3. Protect items from damage during transport and storage.
- 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

- A. Remove: As indicated on drawings.
- B. Remove and Salvage: As indicated on drawings.
- C. Remove and Reinstall: As indicated on drawings.
- D. Existing to Remain: As indicated on drawings.
- E. Dismantle: As indicated on drawings.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1.5 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301.
 - 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- 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.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."
- C. Threaded reinforcement splice couplers equal to Dayton.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I or Type I/II, gray.
 - 2. Fly ash or slag cement will not be allowed
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

- 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
- 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M and potable.

2.5 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
- B. Synthetic Micro-Fiber: Fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.8 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. when 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, dissipating.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture 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.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/C Ratio: 0.50.
 - 3. Slump Limit: 5 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 - 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 - 6. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- 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 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. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

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 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.6 WATERSTOP INSTALLATION

A. Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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 indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- 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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view,.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.
- C. 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 surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view.
 - 2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 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, 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.
 - 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. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

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.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

3.12 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For reinforcing steel. Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product. For masonry units, include material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 FIELD CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 - 2. Density Classification: Lightweight.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for coldweather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.

- E. Aggregate for Mortar: ASTM C 144.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- H. Water: Potable.

2.4 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill or Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: 0.148-inch diameter.
 - 3. Wire Size for Cross Rods: 0.148-inch diameter.
 - 4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 5. Provide with prefabricated corner and tee units.
- C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- B. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
 - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
 - 2. Configuration: Provide one of the following:
 - a. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

2.6 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 - 4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type M.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.6 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3.7 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of siteprepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof, not less than one set of tests per floor.
- D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- E. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- F. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.10 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 3. Protect adjacent surfaces from contact with cleaner.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.11 MASONRY WASTE DISPOSAL

- A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soilcontaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Elevator hoist beams.
 - 2. Shelf angles.
 - 3. Metal ladders.
 - 4. Elevator pit sump covers.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.3 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Provide Shop Drawings for the following:
 - 1. Steel framing and supports for applications where framing and supports are not specified in other Sections.

- 2. Elevator hoist beams.
- 3. Steel pipe columns for supporting construction.
- 4. Shelf angles.
- 5. Metal ladders.
- 6. Elevator pit sump covers.
- B. Welding certificates.
- C. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
2.2 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- D. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Section 033053 "Miscellaneous Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. 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.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

- B. Fabricate units from 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.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate steel pipe columns for supporting construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- D. Galvanize miscellaneous framing and supports where indicated.

2.6 METAL LADDERS

- A. General:
 - 1. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 - 1. Space siderails 18 inches apart unless otherwise indicated.
 - 2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 - 3. Rungs: 3/4-inch- diameter steel bars.
 - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
 - 6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
 - 7. Galvanizeladders, including brackets.

2.7 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 1/8-inch rolled-steel floor plate with four 1-inch- diameter holes for water drainage and for lifting.
- B. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 1/2 inch in least dimension.
- C. Provide steel angle supports as indicated.

2.8 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.

2.9 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.
- B. Galvanize plates.

2.10 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. 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.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. 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.
- C. 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.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for

use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 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.
- B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded 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 dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

Section Includes:

- 1. Framing with dimension lumber.
- 2. Wood blocking and nailers.
- 3. Wood furring.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.3 ACTION SUBMITTALS

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 and net amount of preservative retained.
- 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
- 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
- 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:

- 1. Wood-preservative-treated wood.
- 2. Fire-retardant-treated wood.
- 3. Power-driven fasteners.

1.5 QUALITY ASSURANCE

Testing Agency Qualifications: For testing agency providing classification marking for fireretardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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 grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. 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, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:
 - 1. Concealed blocking.
 - 2. Framing for non-load-bearing partitions.

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2.4 DIMENSION LUMBER FRAMING

Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

- 1. Application: All interior partitions.
- 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine or mixed southern pine; SPIB.
 - c. Spruce-pine-fir; NLGA.
 - d. Hem-fir; WCLIB, or WWPA.
 - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - f. Northern species; NLGA.
 - g. Eastern softwoods; NeLMA.
 - h. Western woods; WCLIB or WWPA.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Cants.
 - 4. Furring.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 - 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 - 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 - 4. Eastern softwoods; No. 2 Common grade; NeLMA.
 - 5. Northern species; No. 2 Common grade; NLGA.
 - 6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- D. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
- E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with

function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
- H. Use steel common 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- 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.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Gypsum Board: Install 2-by-4-inch (edgewise) nominal- size furring vertically at 16 inches o.c.

3.4 INSTALLATION OF WALL AND PARTITION FRAMING

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
 - 1. For interior partitions and walls, provide 2-by-4-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.
 - 2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

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- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.5 **PROTECTION**

Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior trim.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 2. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors 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 and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- D. Samples for Verification:
 - 1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber.
 - 2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
 - 1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
 - 2. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC1.
 - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.

- 2. Preservative Chemicals: Acceptable to authorities having jurisdiction.
- 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
- 4. Do not use material that is warped or does not comply with requirements for untreated material.
- 5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review. 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.

2.3 INTERIOR TRIM

- A. Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: To match existing trim, field verify and submit samples for verification.
 - 2. Maximum Moisture Content: 15 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Face Surface: To match or complement existing.
- B. Lumber Trim for Opaque Finish (Painted Finish):
 - 1. Species and Grade: Eastern white pine; NeLMA or NLGA Finish or 1 Common.
 - 2. Maximum Moisture Content: 15 percent.
 - 3. Finger Jointing: Allowed.
 - 4. Face Surface: Surfaced (smooth).
- C. Moldings for Transparent Finish (Stain or Clear Finish): MMPA WM 4, N-grade wood moldings. Made to patterns matching or complimenting existing.
 - 1. Species and Grade: To match existing trim, field verify and submit samples for verification.
 - 2. Maximum Moisture Content: 15 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Face Surface: To match or complement existing.
 - 5. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
 - 6. Finger Jointing: Not allowed.
 - 7. Matching: Selected for compatible grain and color.
- D. Moldings for Opaque Finish (Painted Finish): Made to patterns matching or complimenting existing.
 - 1. Moldings: MMPA WM 4, P grade.
 - 2. Species and Grade: Eastern white pine; NeLMA or NLGA Finish or 1 Common.
 - 3. Maximum Moisture Content: 15 percent.

- 4. Finger Jointing: Allowed.
- 5. Face Surface: Surfaced (smooth).

2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Low-Emitting Materials: Adhesives shall comply with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- D. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.5 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 - 1. Interior standing and running trim, except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
 - 1. Do not use pieces less than 24 inches long, except where necessary.
 - 2. Stagger joints in adjacent and related standing and running trim.
 - 3. Cope at returns, miter at outside corners, and cope at inside corners to produce tightfitting joints with full-surface contact throughout length of joint.
 - 4. Use scarf joints for end-to-end joints.
 - 5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 7. Install trim after gypsum-board joint finishing operations are completed.
 - 8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 - 9. Fasten to prevent movement or warping.
 - 10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

- 1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces.
- B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 **PROTECTION**

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke barriers.

1.2 ALLOWANCES

A. Penetration firestopping Work is part of an allowance.

1.3 UNIT PRICES

A. Work of this Section is affected by unit prices.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

PENETRATION FIRESTOPPING

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear it's UL classification (Underwriter's Laboratory "Fire Resistance Directory".

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. NUCO Inc.
 - d. RectorSeal Firestop; a CSW Industrials Company.
 - e. Specified Technologies, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Manufactured Piping Penetration Firestopping System: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ProVent Systems, Inc.
 - b. RectorSeal Firestop; a CSW Industrials Company.
 - 2. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

- 3. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- 4. Sleeve: Molded-PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
- 5. Special Coating: Corrosion resistant on interior of fittings.
- G. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. 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.
- H. 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. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping 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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming 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.

- 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning Penetration Firestopping Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Nonstaining silicone joint sealants.
 - 3. Urethane joint sealants.
 - 4. Mildew-resistant joint sealants.
 - 5. Polysulfide joint sealants.
 - 6. Butyl joint sealants.
 - 7. Latex joint sealants.
- B. Related Requirements:
 - 1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

- 1. Joint-sealant location and designation.
- 2. Manufacturer and product name.
- 3. Type of substrate material.
- 4. Proposed test.
- 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion-Test Reports: For each sealant application tested.
- G. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with masonry substrates.

- 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
- 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
- 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
- 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
 - 6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by jointsealant manufacturer.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, 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 joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Everkem Diversified Products, Inc.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.

- e. Polymeric Systems, Inc.
- f. Sika Corporation; Joint Sealants.
- g. The Dow Chemical Company.

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - c. Pecora Corporation.
 - d. Sika Corporation; Joint Sealants.
 - e. The Dow Chemical Company.
 - f. Tremco Incorporated.

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Bostik, Inc.
 - c. Pecora Corporation.
 - d. Sherwin-Williams Company (The).
 - e. Sika Corporation; Joint Sealants.
 - f. Tremco Incorporated.
- B. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Pecora Corporation.
 - c. Permathane®/Acryl-R®; ITW Polymers Sealants North America.

- d. Polymeric Systems, Inc.
- e. Sherwin-Williams Company (The).

2.5 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - c. Pecora Corporation.
 - d. Soudal USA.
 - e. The Dow Chemical Company.
 - f. Tremco Incorporated.
- C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. BASF Corporation.

2.6 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Bostik, Inc.
 - b. Pecora Corporation.

2.7 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Everkem Diversified Products, Inc.
 - b. Franklin International.
 - c. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - d. Pecora Corporation.
 - e. Sherwin-Williams Company (The).
 - f. Tremco Incorporated.

2.8 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Alcot Plastics Ltd.
 - b. BASF Corporation.
 - c. Construction Foam Products; a division of Nomaco, Inc.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- 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. Provide self-adhesive tape where applicable.

2.9 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 to 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 performance of the Work.
- 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, 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 after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates 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 joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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 in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind 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 sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 **PROTECTION**

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-1.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-2.
 - 1. Joint Locations:
 - a. Tile control and expansion joints.
 - b. Vertical joints on exposed surfaces of unit masonry concrete walls and partitions.
 - 2. Joint Sealant: Urethane, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement JS-3.
 - 1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
 - 2. Joint Sealant: Acrylic.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-4.
 - 1. Joint Locations:
 - a. Tile control and expansion joints where indicated.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Concealed mastics JS-5.
 - 1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - 2. Joint Sealant: Butyl-rubber based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Five-ply flush wood veneer-faced doors for transparent finish.
 - 2. Five-ply flush wood doors for opaque finish.
 - 3. Fire-rated wood door frames.
 - 4. Factory priming flush wood doors and frames.
 - 5. Factory finishing flush wood doors and frames.
 - 6. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Requirements:
 - 1. Section 064023 "Interior Architectural Woodwork" for wood door frames.
 - 2. Section 064216 "Flush Wood Paneling" for requirements for veneers from the same flitches for both flush wood doors and flush wood paneling.
 - 3. Section 088000 "Glazing" for glass view panels in flush wood doors.
 - 4. Section 099123 "Interior Painting" and Section 099300 "Staining and Transparent Finishing" for field finishing doors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Door core materials and construction.
 - 2. Door edge construction
 - 3. Door face type and characteristics.
 - 4. Door trim for openings.
 - 5. Door frame construction.
 - 6. Factory-machining criteria.
 - 7. Factory-priming and finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
 - 1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
 - 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 - 3. Details of frame for each frame type, including dimensions and profile.
 - 4. Dimensions and locations of blocking for hardware attachment.
 - 5. Dimensions and locations of mortises and holes for hardware.

- 6. Clearances and undercuts.
- 7. Requirements for veneer matching.
- 8. Doors to be factory either primed or finished depending on location in building (door types reflect finishes for each door type) and application requirements.
- C. Samples for Initial Selection: For factory-finished doors and factory-finished door frames.
- D. Samples for Verification:

Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of firerated door assemblies shall comply with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies shall comply with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for

fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with UL 10C or NFPA 252.

- 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
- 2. Temperature-Rise Limit: Where indicated on Drawings, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT

Interior Doors: D-2:

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Eggers Industries.
 - b. Lambton Doors.
 - c. Oshkosh Door Company.
 - d. VT Industries Inc.
- 2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
- 3. ANSI/WDMA I.S. 1A Grade: Custom.
- 4. Faces: Single-ply wood veneer not less than 1/50 inch thick.
- 5. Species: To match existing field verify for consistency with existing doors.
- 6. Match between Veneer Leaves: Book match field verify for consistency with existing doors.
- 7. In "Assembly of Veneer Leaves on Door Faces" Subparagraph below, first option is standard for Premium-grade doors. Third option is standard for Custom-grade doors.
- 8. Assembly of Veneer Leaves on Door Faces: Balance match field verify for consistency with existing.
- 9. Exposed Vertical Edges: Same species as faces or a compatible species Architectural Woodwork Standards edge Type A.
- 10. Core: ANSI A208.1, Grade LD-1 particleboard.
- 11. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS FOR OPAQUE FINISH

- A. Interior Solid-Core Doors: D-1, D-3, D-5:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eggers Industries.
 - b. Lambton Doors.
 - c. Oshkosh Door Company.
 - d. VT Industries Inc.
 - 2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
 - 3. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.
 - 4. ANSI/WDMA I.S. 1A Grade: Custom.
 - 5. Faces: MDO.
 - a. Apply MDO to standard-thickness, closed-grain, hardwood face veneers or directly to high-density hardboard crossbands.
 - b. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
 - c. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
 - 6. Exposed Vertical and Top Edges: Any closed-grain hardwood.

Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.

- 7. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, Grade LD-1 particleboard.
- 8. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
- 9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 FIRE-RATED WOOD DOOR FRAMES

- A. Interior Frames:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Eggers Industries.
- b. Lambton Doors.
- c. Oshkosh Door Company.

Basis of Design Product: TGP Fireframes® Hardwood Series 45-Minute Fire-Rated Frame:

- 1) Type: 45-Minute Rated Frame.
- 2) Fire Rating: 45 minutes.
- 3) Pressure Testing Type: Positive.
- 4) Provide frame structure, minimum 1-1/2-inch thick by 5-5/16-inch wide, complying with referenced construction requirements.
- 5) Material: 1/8" thick resawn hardwood face (not veneered) with minimum 1/4" thick hardwood edges bonded to engineered core in accordance with ASTM D 5456.
- 6) Wood Species and Cut: . Match species indicated for other types of finished architectural woodwork located in same area of building, unless otherwise indicated. Specific gravity 0.42 at 12% moisture content.
- 7) Classified: Underwriters Laboratories (UL)
- 8) Gasketing at 45-Minute Positive Pressure Frame: Pemko #S88.
- 9) Fire clips not needed.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.7 FACTORY PRIMING

A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099123" Interior Painting."

2.8 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
 - 1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 2. Finish faces, all four edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated on Drawings to receive transparent finish.
- C. Transparent Finish:
 - 1. ANSI/WDMA I.S. 1A Grade: Custom.
 - 2. Finish: ANSI/WDMA I.S. 1A TR-6 Catalyzed Polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Effect: End result to closely complement existing stained door finishes.
 - 5. Sheen: to complement existing.
- D. Opaque Finish:
 - 1. ANSI/WDMA I.S. 1A Grade: Custom.
 - 2. Finish: ANSI/WDMA I.S. 1A OP-6 Catalyzed Polyurethane.
 - 3. Color: Field finished to match existing doors with opaque finish.
 - 4. Sheen: To match existing doors with opaque finish.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors and frames to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 - 1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

- 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
- 3. Install fire-rated doors and frames in accordance with NFPA 80.
- 4. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - 2. Machine doors for hardware.
 - 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
 - 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Provide inspection of installed Work through WI's Certified Compliance Program, certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

- 3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING

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

END OF SECTION 081416

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - 2. Cylinders for door hardware specified in other Sections.
- B. Related Requirements:
 - 1. Section 081416 "Flush Wood Doors" for integral intumescent seals provided as part of labeled fire-rated assemblies.

1.2 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Keying Conference: Conduct conference at Project site.
 - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
 - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.

- d. Requirements for access control.
- e. Address for delivery of keys.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Samples for Verification: For each type of exposed product, in each finish specified.
 - 1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
 - 2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- E. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Fastenings and other installation information.

- e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
- f. Mounting locations for door hardware.
- F. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of electrified door hardware.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware schedule.

1.7 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 coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.8 WARRANTY

Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

- 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- C. Accessibility Requirements: For door hardware on doors in an accessible route, comply with ICC A117.1.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

2.3 HINGES

Hinges: BHMA A156.1.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Allegion plc.
- b. Baldwin Hardware Corporation.
- c. Cal-Royal Products, Inc.
- d. Hager Companies.
- e. McKinney Products Company; an ASSA ABLOY Group company.

2.4 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As indicated on Drawings.
 - 2. Levers: Wrought.
 - 3. Escutcheons (Roses): Wrought.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Allegion plc.
- b. Hager Companies.
- c. SARGENT Manufacturing Company; ASSA ABLOY.

2.5 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
- B. Keys: Brass.

2.6 SURFACE CLOSERS

Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Allegion plc.
- b. Hager Companies.
- c. Norton Door Controls; an ASSA ABLOY Group company.
- d. SARGENT Manufacturing Company; ASSA ABLOY.

2.7 MECHANICAL STOPS AND HOLDERS

Wall- and Floor-Mounted Stops: BHMA A156.16.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Allegion plc.
- b. Baldwin Hardware Corporation.
- c. Cal-Royal Products, Inc.
- d. Hager Companies.
- e. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.8 DOOR GASKETING

Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

- a. Hager Companies.
- b. National Guard Products, Inc.
- c. Pemko Manufacturing Co.

2.9 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, 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.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

2.10 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- Mounting Heights: Mount wood door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood 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. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period. Replace construction cores with permanent cores as directed by Owner.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 CLEANING AND PROTECTION

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

3.6 MAINTENANCE SERVICE

Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.7 DEMONSTRATION

Engage Installer to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

Section Includes:

- 1. Glass for doors.
- 2. Glazing sealants and accessories.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.
- C. IBC: International Building Code (2015)
- D. KBC Kentucky Building Code (2018).

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Sample Warranties: For special warranties.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Gardner Glass, Inc.
 - 2. GGI; General Glass International.
 - 3. Guardian Glass; SunGuard.
 - 4. Oldcastle BuildingEnvelope.
 - 5. Pilkington North America.
 - 6. Viracon, Inc.
 - 7. Vitro Architectural Glass.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to

remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Retain "Delegated Design" Paragraph below if Contractor is required to assume responsibility for design.

Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

- A. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- C. Strength: Where annealed float glass is indicated, provide annealed float glass, heatstrengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heatstrengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 GLAZING SEALANTS

- A. General:
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant:

- 1. Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) GE Construction Sealants; Momentive Performance Materials Inc.
 - 2) May National Associates, Inc.; a subsidiary of Sika Corporation.
 - 3) Pecora Corporation.
 - 4) Sika Corporation.
 - 5) The Dow Chemical Company.
 - 6) Tremco Incorporated.
 - b. Applications: To be installed in non-rated doors with half glass vision lite kit.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; and complying with ASTM C1281 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 Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with 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:
 - 1. Silicone with a Shore A durometer hardness of 85, plus or minus 5.

- 2. Type recommended by sealant or glass manufacturer.
- D. Spacers:
 - 1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
 - 2. Type recommended by sealant or glass manufacturer.
- E. Edge Blocks:
 - 1. Silicone with a Shore A durometer hardness per manufacturer's written instructions.
 - 2. Type recommended by sealant or glass manufacturer.
- F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit 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 publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. 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.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- 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 length plus width is larger than 50 inches.
 - 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 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.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.TAPE GLAZING
- L. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

- M. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- N. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- O. 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.
- P. Do not remove release paper from tape until right before each glazing unit is installed.
- Q. Apply heel bead of elastomeric sealant.
- R. 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.
- S. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.4 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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 buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.5 MONOLITHIC GLASS SCHEDULE

Glass Type GL-3: Clear fully tempered float glass.

- 1. Minimum Thickness: 6 mm.
- 2. Safety glazing required.

END OF SECTION 088000

SECTION 088813 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire-protection-rated glazing.

1.2 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers and glass testing agency.
- B. Product Certificates: For each type of glass and glazing product, from manufacturer.
- C. Sample Warranties: For special warranties.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Double Glazing Units with Clear Gel Fill: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of double glazing units with clear gel fill is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is the leakage of gel fill from units, air bubbles within units, or obstruction of vision by contamination or deterioration of gel.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council, the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

- A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Ultraclear Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.
- C. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- D. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
 - 2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing

according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.

- 1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
- B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, ultraclear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Pilkington North America.
 - b. Technical Glass Products.
 - c. Vetrotech Saint-Gobain.

2.6 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. GE Construction Sealants; Momentive Performance Materials Inc.
 - b. The Dow Chemical Company.
 - c. Tremco Incorporated.
 - 2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; and complying with ASTM C1281 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.
- D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 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. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- C. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit 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 publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- 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.
- B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. 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.
- 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. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. 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.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 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 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.
- H. 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.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

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. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing 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 right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. 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.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch 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. Installation with Drive-in Wedge Gaskets: 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.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial washaway from glass.

3.7 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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 buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass that is damaged during construction period.
- D. 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 in writing by glass manufacturer.

3.8 FIRE-PROTECTION-RATED GLAZING SCHEDULE

A. Glass Type [GL-1 and GL-2]: 45-minute fire-protection-rated glazing; laminated glass with intumescent interlayers.

END OF SECTION 088813
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Gypsum wallboard.
 - 2. Gypsum board, Type X.
 - 3. Gypsum ceiling board.
 - 4. Interior trim.
 - 5. Sound-attenuation blankets.
 - 6. Acoustical sealant.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.
- D. Samples for Verification: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. ClarkDietrich.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - 2. Thickness: 5/8 inch.
 - 3. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. National Gypsum Company.
 - d. USG Corporation.
 - 2. Thickness: 5/8 inch.

- 3. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. CertainTeed Gypsum.
 - c. Georgia-Pacific Gypsum LLC.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - 2. Thickness: 1/2 inch.
 - 3. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.
 - f. Base-of-Wall Galvanized Moisture Barrier Trim: Galvanized-steel sheet, 2 inches high.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: 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 drying-type, all-purpose compound.

- a. Use setting-type compound for installing paper-faced metal trim accessories.
- 3. Fill Coat: For second coat, use 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.

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: As indicated on Drawings.
 - 2. Type X: As indicated on Drawings.
 - 3. Ceiling Type: As indicated on Drawings.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

- b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
- 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLATION OF TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 **PROTECTION**

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

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

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Porcelain tile.
 - 2. Crack isolation membrane.
 - 3. Metal edge strips.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.2 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Face Size: Actual tile size, excluding spacer lugs.
- D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:

- 1. Full-size units of each type and composition of tile and for each color and finish required.
- 2. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and 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.
 - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

1.8 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 requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Waterproof membrane.
 - 2. Crack isolation membrane.
 - 3. Metal edge strips.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 - 1. Provide tile complying with Standard grade requirements.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Porcelain Tile Type T-1: Unpolished porcelain tile.

- 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. American Olean; a division of Dal-Tile Corporation.
- 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
- 3. Face Size: 23-3/8" x 23-3/8".
- 4. Face Size Variation: Rectified.
- 5. Thickness: 3/8 inch.
- 6. Face: Plain with square or cushion edges.
- 7. Dynamic Coefficient of Friction: Not less than 0.42.
- 8. Tile Color, Glaze, and Pattern: American Olean, Neospeck Colorbody porcelain floor tile, unpolished, Medium Gray NE04.
- 9. Grout Color: As selected by Architect from manufacturer's full range.
- 10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Cove Base, module size 6" x 12".
- B. Porcelain Tile Type T-2: Unpolished porcelain tile.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Florida Tile, Inc.
 - 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 - 3. Face Size: 18" x 18".
 - 4. Face Size Variation: Rectified.
 - 5. Thickness: 1/4 inch.
 - 6. Face: Plain with square or cushion edges.
 - 7. Dynamic Coefficient of Friction: Not less than 0.42.
 - 8. Tile Color, Glaze, and Pattern: American Olean, Maltese porcelain floor tile, unglazed, Porto Cream 29622.
 - 9. Grout Color: As selected by Architect from manufacturer's full range.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Noble Company (The).

- C. PVC Sheet: PVC heat-fused on both sides to facings of nonwoven polyester; 0.040-inch nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Compotite Corporation.
- D. Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch nominal thickness.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Schluter Systems L.P.
- E. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. H.B. Fuller Construction Products Inc. / TEC.
 - c. LATICRETE SUPERCAP, LLC.
 - d. MAPEI Corporation.
- F. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. H.B. Fuller Construction Products Inc. / TEC.
 - c. MAPEI Corporation.
 - d. Southern Grouts & Mortars, Inc.
- G. Latex-Portland Cement Crack-Resistant Mortar: Flexible mortar consisting of cement-based mix and latex additive.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ARDEX Americas.
 - b. Boiardi Products Corporation; a QEP company.
 - c. H.B. Fuller Construction Products Inc. / TEC.
 - d. MAPEI Corporation.

- H. Crack Isolation Membrane and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both a crack isolation membrane and tile-setting adhesive in a two-step process.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boiardi Products Corporation; a QEP company.
 - b. Bostik, Inc.

2.5 SETTING MATERIALS

- A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. H.B. Fuller Construction Products Inc. / TEC.
 - c. LATICRETE SUPERCAP, LLC.
 - d. MAPEI Corporation.
 - e. Southern Grouts & Mortars, Inc.

2.6 GROUT MATERIALS

- A. Standard Cement Grout: ANSI A118.6.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. H.B. Fuller Construction Products Inc. / TEC.
 - b. LATICRETE SUPERCAP, LLC.
 - c. MAPEI Corporation.
 - d. Southern Grouts & Mortars, Inc.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils thick.
- C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; nickel silver exposed-edge material.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Bonsal American, an Oldcastle company.
 - b. Custom Building Products.
 - c. Jamo Inc.
 - d. Southern Grouts & Mortars, Inc.
 - e. Summitville Tiles, Inc.

2.8 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

- 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
- 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
- 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage: Tile floors consisting of tiles 8 by 8 inches or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. 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.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 1. Where adjoining tiles on floor or base are specified or indicated to be same size, align joints.
 - 2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths: Porcelain Tile: 1/4 inch.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- I. Metal Edge Strips: Install at locations indicated.
- J. Floor Sealer: Apply floor sealer to grout joints according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INSTALLATION OF CRACK ISOLATION MEMBRANE

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

- 1. Remove grout residue from tile as soon as possible.
- 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 **PROTECTION**

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. Porcelain Tile Installation T-1: TCNA F113; thinset mortar.
 - a. Ceramic Tile Type: T-1.
 - b. Thinset Mortar: Standard dry-set mortar.
 - c. Grout: Standard sanded cement grout.
 - 2. Ceramic Tile Installation T-2: TCNA F125-Full; thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type: T-2.
 - b. Thinset Mortar: Modified dry-set mortar.
 - c. Grout: Standard sanded cement grout.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch long Samples of each type, finish, and color.
 - 3. Clips: Full-size seismic clips.
- D. Delegated-Design Submittal: For seismic restraints for ceiling systems.
 - 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Size and location of initial access modules for acoustical panels.
 - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.

- 7. Minimum Drawing Scale: 1/4 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E1264.

2.3 ACOUSTICAL PANELS [ACP-2]

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: CE (perforated, small holes and lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): 0.83.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.50.
- H. Edge/Joint Detail: Angled Tegular.
- I. Thickness: 5/8 inch.

- J. Modular Size: 24 by 24 inches.
- K. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273, ASTM D3274, or ASTM G21 and evaluated according to ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEM: [MSS]

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Armstrong World Industries.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification, and finish indicated.
- C. 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, G30 coating designation; with prefinished 15/16-inch wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel.
 - 5. Cap Finish: Painted white.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.

- 2. Power-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 according to ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - 2. Stainless-Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
 - 3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
 - 4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch diameter wire.
- C. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- D. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.6 METAL EDGE MOLDINGS AND TRIM [EM]

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc; Standard Edge Trim
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 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, areas, and conditions, including 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 with requirements

for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. 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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
- 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. 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.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- 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. 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 fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
 - 1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 3. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Gypsum board.
 - 2. Plaster.
- B. Related Requirements:
 - 1. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Paints.
 - 3. Pratt & Lambert.
 - 4. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Wood: 15 percent.
 - 3. Gypsum Board: 12 percent.
 - 4. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Wood Substrates:
 - 1. Scrape and clean knots and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Wood Substrates: Wood trim and Doors.
 - 1. Alkyd System MPI INT 6.3B:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45, Sherwin- Williams Premium Wall & Wood Primer.
 - b. Intermediate Coat: Alkyd, interior, matching topcoat.
 - c. Topcoat: Alkyd, interior, semi-gloss (MPI Gloss Level 5), MPI #47, Sherwin-Williams ProMar 200 Interior Alkyd Paint.
- B. Gypsum Board Substrates:
 - 1. Latex over Latex Sealer System MPI INT 9.2A:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50, Sherwin- Williams ProMar 200 Zero VOC Interior Latex Primer.
- b. Prime Coat: Latex, interior, matching topcoat.
- c. Intermediate Coat: Latex, interior, matching topcoat.
- d. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52, Sherwin- Williams ProMar 200 Zero VOC Interior Latex.
- 2. Latex over Alkyd Primer System (for Plaster Only) MPI INT 9.2K:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45, Sherwin- Williams Premium Wall & Wood Primer.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52, Sherwin- Williams -ProMar 200 Zero VOC Interior Latex.

END OF SECTION 099123

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and application of wood stains and transparent finishes.
 - 1. Interior Substrates: Dressed lumber (finish carpentry or woodwork).

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- D. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- E. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of product.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish required.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square or 8 inches long.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Stains and Transparent Finishes: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Paints.
 - 3. Pratt & Lambert.
 - 4. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in wood finish systems schedules for the product category indicated.

2.2 MATERIALS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:

- 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- 2. For each coat in a paint system, products shall be recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. Stain Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Interior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with finish application only after unsatisfactory conditions have been corrected.
 - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.

- 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Interior Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
 - 3. Sand surfaces exposed to view and dust off.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 - 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 INTERIOR WOOD -FINISH-SYSTEM SCHEDULE

- A. Wood Substrates: Wood trim, doors and windows.
 - 1. Alkyd Varnish over Stain System MPI INT 6.3D:
- a. Stain Coat: Stain, semitransparent, for interior wood, MPI #90, Sherwin-Williams; MINWAX Performance Series Tintable Interior Wood Stain7150/7151 Series.
- b. First Intermediate Coat: Alkyd, sanding sealer, clear, MPI #102, Sherwin-Williams MINWAX Performance Series Fast-Dry Sanding Sealer 8158/8458.
- c. Second Intermediate Coat: Varnish matching topcoat.
- d. Topcoat: Varnish, interior, flat (MPI Gloss Level 1), MPI #74, Colortek (Kassa Paints Grp) Sytetic Oil Based Paints Urethane 5283012911990.
- e. Topcoat: Varnish, interior, semi-gloss (MPI Gloss Level 5), MPI #74, Colortek (Kassa Paints Grp) Sytetic Oil Based Paints Urethane 5283012911990.

END OF SECTION 099300

SECTION 142123.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Machine-room-less electric traction passenger elevators.

1.2 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.
- B. Service Elevator: A passenger elevator that is also used to carry freight.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
 - 2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
 - 2. Include large-scale layout of car-control station and standby power operation control panel.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.
- C. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch-square Samples of sheet materials; and 4-inch lengths of running trim members.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

- 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
- 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's or Installer's standard operation and maintenance manual, according to ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.
- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Owner, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish

templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: 5 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ThyssenKrupp Elevator; Evolution 100 or a comparable product by one of the following:
 - 1. KONE Inc.
 - 2. Otis Worldwide Corporation.
 - 3. Schindler Elevator Corp.
- B. Source Limitations: Obtain elevators from single manufacturer.
 - 1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

- 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
- 2. Project Seismic Design Category: D.
- 3. Elevator Component Importance Factor: 1.0.
- 4. Design earthquake spectral response acceleration short period (Sds) for Project is 0.573.
- 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
- 6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
 - 1. Elevator Number(s): 1.
 - 2. Rated Load: 2100 lb.
 - 3. Freight Loading Class for Service Elevator(s): Class A.
 - 4. Rated Speed: 200 fpm.
 - 5. Operation System: Selective-collective automatic operation.
 - 6. Auxiliary Operations:
 - a. Standby power operation.
 - b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
 - c. Automatic dispatching of loaded car.
 - d. Nuisance-call cancel.
 - e. Automatic operation of lights and ventilation fans.
 - 7. Car Enclosures:
 - a. Inside Width: Not less than 68 inches from side wall to side wall.
 - b. Inside Depth: Not less than 51 inches from back wall to front wall (return panels).
 - c. Inside Height: Not less than 88 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - e. Car Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - f. Side and Rear Wall Panels: Plastic laminate.
 - g. Reveals: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - i. Door Sills: Aluminum.
 - j. Ceiling: Satin stainless steel, ASTM A480/480M, No. 4 finish.
 - k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, at sides and rear of car.
 - 1. Floor recessed and prepared to receive ceramic tile (specified in Section 093013 "Ceramic Tiling").
 - 8. Hoistway Entrances:

- a. Width: 36 inches.
- b. Height: 84 inches.
- c. Type: Single-speed side sliding.
- d. Frames: Enameled or powder-coated steel.
- e. Doors: Enameled or powder-coated steel.
- f. Sills: Aluminum.
- 9. Hall Fixtures: Satin stainless steel, ASTM A480/480M, No. 4 finish.
- 10. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/480M, No. 4 finish.

2.4 TRACTION SYSTEMS

- A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.
- B. Fluid for Hydraulic Buffers: Fire-resistant fluid.
- C. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- D. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.
- E. Car Frame and Platform: Bolted- or welded-steel units.
- F. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

- A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Standby Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at lower level. Manual operation causes automatic operation to cease.
 - 2. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

- 3. Automatic Dispatching of Loaded Car: When carload exceeds 80 percent of rated capacity, doors begin closing.
- 4. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
- 5. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.

2.6 DOOR REOPENING DEVICES

- A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. Provide wall panels, withcar roof, access doors, power door operators, and ventilation.
 - 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 - 1. Subfloor:
 - a. Exterior, underlayment grade plywood, not less than 5/8-inch nominal thickness.
 - 2. Floor Finish:
 - a. Specified in Section 093013 CERAMIC TILING.
 - 3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
 - 4. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to manufacturer's standard honeycomb core with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels shall have a flame-spread index of 25 or less, when tested according to ASTM E84. Plastic-laminate color, texture, and pattern as selected by Architect from elevator manufacturer's full range.
 - 5. Fabricate car with recesses and cutouts for signal equipment.
 - 6. Fabricate car door frame integrally with front wall of car.
 - 7. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet or by laminating stainless steel sheet to exposed faces and edges of enameled or

powder-coated steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

- 8. Sight Guards: Provide sight guards on car doors.
- 9. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
- 10. Metal Ceiling: Flush panels, with incandescent downlights in the center of each panel. Align ceiling panel joints with joints between wall panels.
- 11. Light Fixture Efficiency: Not less than 35 lumens/W.
- 12. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 - 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252.
 - 1. Fire-Protection Rating: 1-1/2 hours with 30-minute temperature rise of 450 deg F.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 - 1. Enameled or Powder-Coated Steel Frames: Formed from cold- or hot-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 - 2. Enameled or Powder-Coated Steel Doors: Flush, hollow-metal construction; fabricated from cold-rolled steel sheet. Provide with factory-applied enamel or powder-coat finish; colors as selected by Architect from manufacturer's full range.
 - 3. Sight Guards: Provide sight guards on doors matching door edges.
 - 4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
 - 5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

- A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed or semirecessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 - 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.

- 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
 - 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, 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. Include travel direction arrows if not provided in car-control station.
- F. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Equip units with buttons for calling elevator and for indicating desired direction of travel.
- G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:
 - 1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.
- H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
- I. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above hoistway entrance at ground floor. Provide units with flat faceplate and with body of unit recessed in wall.
- J. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.
- K. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.
- C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.
- D. Stainless Steel Bars: ASTM A276, Type 304.
- E. Aluminum Extrusions: ASTM B221, Alloy 6063.
- F. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications.

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 of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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 to minimize vibration transmission to structure and structure-borne noise due to 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 car. 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, up or down, regardless of load and travel direction.
- G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.
- H. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. Place hall lanterns either above or beside each hoistway entrance.
 - 2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Operating Test: Load elevator 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 machine during 30-minute test period. Record failure to perform as required.
- C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 **PROTECTION**

- 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
- 2. Provide strippable protective film on entrance and car doors and frames.
- 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
- 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
- 5. Do not load elevators beyond their rated weight capacity.
- 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
- 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s).

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of 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. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance during normal working hours.
 - 2. Perform emergency callback service during normal working hours with response time of two hours or less.

END OF SECTION 142123.16

SECTION 230000 - GENERAL PROVISIONS FOR MECHANICAL

PART 1 - GENERAL

1.1 SCOPE

- A. Special Conditions section and General Requirements section are made part of this Division.
- B. This Division includes the sections, but not necessarily limited to, listed in the Division Table of Contents.

1.2 GENERAL

- A. The work included in this division consists of furnishing all labor, equipment, transportation, excavation, backfill, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Mechanical System(s) indicated or specified in the Contract Documents.
- B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and/or specifications, shall be included as part of this Contract.
- C. It is the intent of this Contract to deliver to the Owner's a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing items which interfere with the new work required for the complete installation without additional cost to the Owner.

1.3 INTENT

- A. It is the intention of the Contract Documents to call for finished work, tested and ready for operation.
- B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

1.4 EXAMINATION OF SITE AND CONDITIONS

A. Each Proposer shall inform himself of all conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. Each Proposer shall also fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation

of materials, facilities and services, availability of utilities, etc. His proposal shall cover all expenses or disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after bids are accepted.

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings are diagrammatic only and indicate the general arrangement of the work to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item, which may be necessary to complete the systems. All Proposers shall anticipate that additional items may be required and submit their bid accordingly.
- B. The drawings and specifications are intended to supplement each other. No Proposer shall take advantage of conflict between them, or between parties of either. Should this condition exist, the Proposer shall request a clarification not less than twelve days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.
- C. The drawings and specifications shall be considered to be cooperative and anything appearing in the specifications, which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
- D. The Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- E. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- F. Should conflict or overlap (duplication) of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.
- G. Unless dimensioned, the drawings only indicate approximate locations of equipment, piping, ductwork, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.
- H. Where on the Drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.
- I. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

- J. Where on the Contract Documents the word typical is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.
- K. Special Note: Always check ceiling heights indicated on Architectural Drawings and Schedules and insure that they may be maintained after all mechanical and electrical equipment is installed. Do not install equipment in the affected area until the conflict is resolved.

1.6 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- A. By execution of this Contract, the Contractor warrants that he has visited the site of the proposed work, and fully acquainted himself with the conditions there existing relating to construction and labor and that he fully understands the facilities, difficulties, and restrictions attending the execution of the work under Contract. The Contractor further warrants that he has thoroughly examined and is familiar with the drawings, specifications and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract, his failure, when he was bidding on this Contract, to receive or examine any form, instrument, or document, or to visit the site and acquaint himself with the conditions there existing, in no way relieves the Contractor. The Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding conditions for which he should have been on prior notice.
- B. Before ordering material or performing any work, the Contractor shall verify all measurements at the work site. Any difference between dimensions on the Drawings and actual measurements shall be brought to the Engineer's attention for his consideration before the work may proceed. No extra compensation will be allowed because of difference between actual measurements and dimensions indicated on the Drawings. The Contractor shall assume full responsibility for accuracy of measurements obtained at the Work Site.
- C. Dimensions, which are lacking, shall be obtained from the Architect. In no case shall Drawings be scaled.
- D. All subcontractors shall familiarize themselves with all of the conditions relating to this Contract since the terms set forth in the General Conditions binds all subcontractors to the Contract.

1.7 STRUCTURAL RESPONSIBILITY

A. This contractor, in performing installation of his equipment and related work, shall be responsible for properly bracing, supporting, etc., any construction to guard against cracking settling, collapsing, displacing or weakening. No structural member shall be cut or otherwise weakened in any manner without the expressed consent of the Architect/Engineer.

1.8 WORK LAYOUT

A. This contractor shall layout his work from construction lines and levels established by the General Contractor and shall be responsible for the proper location and placement of his work.

B. Maintain all benchmarks, monuments, and other reference points; replace as directed if disturbed or destroyed.

1.9 UTILITIES

A. Work confronting existing utilities shall be coordinated with the regulatory agencies and utility companies. Liability for damage to adjacent property and/or utilities shall be the burden of the contractor.

1.10 PROTECTION OF THE BUILDING

- A. This contractor shall not store materials or equipment on any roof of any building in such quantity that these parts of the building will be overloaded in any way.
- B. This contractor shall exercise care and shall confine all work within the contact limit lines.

1.11 PROTECTION OF STORED EQUIPMENT

A. Provide suitable storage for, and completely protect all materials and equipment prior to installation. Storage shall be dry, clean and safe. Any materials or equipment damaged, deteriorated, rusted or defaced due to improper storage shall be fully repaired, refinished or replaced, as directed by the Engineer, and any materials or equipment lost through theft or mishandling shall be replaced, all without additional cost to the Owner.

1.12 COORDINATION BETWEEN TRADES

- A. Work under this Division shall be coordinated with work of the other Divisions.
- B. Each Proposer shall review all drawings and specifications including Architectural, Mechanical, Electrical, Fire Protection, Landscaping, Structural, Surveys, etc., to insure that the work he intends to provide does not encroach a conflict with or affect the work of others in any way. Where such effect does occur it shall be the Proposer's responsibility to satisfactorily eliminate any such encroachment conflict or effect prior to the submission of his proposal. Each Proposer shall in particular insure that there is adequate space to install his equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded to the Proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to insure adequate spaces.
- C. It shall be the responsibility of this contractor to leave the necessary room for other trades. No extra compensation will be allowed to cover the cost of relocating piping, equipment, ductwork, etc., or equipment found encroaching on space required by others.
- D. This contractor shall make all mechanical connections, etc., to equipment furnished by others whenever such equipment is shown on any part of the drawings or mentioned in any section of the specifications, unless otherwise specified.

1.13 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. When this contractor requests approval of substitute materials and/or equipment, except when under formal alternate proposal, it shall be understood and agreed that such substitution, if approved, will be made without cost to the Owner or Engineer, regardless of changes in connections, spacing, electrical services, building space requirements, etc. In all cases where substitutions affect other trades, the contractor offering such substitutions shall reimburse all affected contractors for all necessary changes in their work.

1.14 CODES AND STANDARDS

- A. Pertinent Federal, State and Local requirements and regulations are hereby made part of this contract. In case of conflict between Contract Documents and above listed requirements, the latter shall govern. Requirements of authority having local jurisdiction shall supersede all other requirements. Use of the term "code" in sections of the specification refers to applicable requirements and regulations of above agencies.
- B. Compliance with the Occupational Safety and Health Act shall be the responsibility of the contractor and under no circumstances shall the Engineer be an authority or be held responsible for any acts concerning this regulation.
- C. All equipment and material shall meet the minimum requirements of seismic bracing as governed by the authority having jurisdiction.

1.15 PROJECT CLEAN-UP

- A. The Contractor shall export off site, all debris resulting from work under this Division. Burning of debris at the project site is not permitted.
- B. Each contractor shall maintain his portion of this project in a neat and orderly fashion, disposing of debris, cartons, crates and boxes as the contents are installed in the project. This clean up shall be accomplished each day in order not to create hardships on the other trades.

1.16 INSTALLATION

- A. Installation of all mechanical equipment for the project as specified in these specifications and indicated on the drawings shall be in accordance with the general requirements of this section. Additional installation requirements applicable to individual systems are specified in the specific system section.
- B. All equipment shall be installed at locations indicated on the drawings and as specified herein.
- C. Assembly and installation of equipment shall be in strict accordance with manufacturer's installation instructions.
- D. Equipment shall be securely anchored in place. Care shall be exercised to correctly orient equipment before securing in place.

E. All equipment and material installations shall meet the minimum requirements of seismic bracing as governed by the authority having jurisdiction.

1.17 OBSOLETE OR REMOVED EQUIPMENT AND MATERIALS

- A. The contractor shall remove all existing materials and equipment made obsolete by, and interfering with the additions, alterations, or razing as shown on the plans and specified. Maintain such existing equipment and materials intact and in existing condition insofar as possible.
- B. Unless otherwise specifically stated in the specifications or shown on the drawings, all such removed material and equipment, not to be reused, shall be removed from the site and disposed of in a proper manner.

1.18 PERMITS, FEES AND CERTIFICATES

A. Each respective contractor shall obtain and pay all permits and licenses required by Federal, State and Local Ordinances for his type work. All fees in connection with inspections, permits, licenses, approvals, etc. shall be paid by the contractor whose work is affected.

1.19 TESTING AND ADJUSTMENT

- A. The complete installation shall be tested as in regular service.
- B. Adjust all belts, sheaves, dampers, valves, etc., and leave in full and successful working condition. Lubricate all motors as recommended by manufacturer's instructions.
- C. All failures or defects in workmanship or material, which are revealed by the tests, shall be promptly corrected and the test reconducted.
- D. This Contractor shall be responsible for all materials and labor to provide sheave, belt and/or pulley replacement to meet the required airflows and/or tolerances specified.

1.20 MECHANICAL CONTRACTOR QUALIFICATIONS

- A. The successful Mechanical Contracting Firm for this project shall have:
 - 1. Master and Journeyman Plumber's License.
 - 2. Fire Protection Sprinkler Contractor License.
 - 3. Heating, Ventilation and Air Conditioning Master Contractor and Journeyman Mechanic License.

1.21 GUARANTEES AND WARRANTIES

A. This Contractor shall guarantee all equipment, apparatus, materials and workmanship entering into this contract to be the best of its respective kind, and shall replace all parts at his own

expense, which have been proven defective, per the terms of the Contract. Items of equipment, which may have longer guarantee's, shall have warranties and guarantees completed, in order, and in effect at the time of final acceptance of the work by the Engineer/Architect. This contractor shall furnish all such warranties and guarantees at the time of final acceptance of the work.

1.22 SHOP DRAWINGS AND OTHER RELATED SUBMITTALS

- A. The type of submittal information required for each item of equipment is scheduled at the end of this section. Shop Drawings may be submitted electronically. Electronic copies shall be in PDF Format and a single file for each shop drawing. Each submittal shall be labeled with specification section and identifying number of the submittal. Submittals not properly identified will be returned without review.
- B. Unless otherwise specified, materials and equipment must be a standard product of manufacturers regularly engaged in production of such items.
 - 1. The contractor shall secure right to use any patented article, method or apparatus used in work.
 - 2. When substitute item of equipment has been submitted for approval, the mechanical contractor shall submit layout drawings indicating the changes necessary to adapt the substitute item of equipment to the design, when requested by the Engineer. All cost of the requested drawings shall be the responsibility of the contractor offering the substitutions.
 - 3. Under no circumstances will materials be considered for substitution, which are not a product of a manufacturer regularly engaged in production of such material or which is a product of one who merely assembles products of other manufacturers into fabricated units. Material submitted for substitution shall be subject to express and implied warranties of one manufacturer only.
- C. If substitution of material results in incidental extra costs on part of any trade under contract, such costs shall be borne by contractor desiring substitution.
 - 1. Submittal data shall include specification data, such as metal gauges, finishes, optional accessories, etc., even though such equipment and materials may be detailed on the drawings or specified. In addition, the submittal data shall include performance (certification) data, wiring diagrams where applicable, accurate dimensional data and a recommended spare parts list. Outline or dimensional drawings alone are not acceptable.
 - 2. No roughing-in connections, etc., shall be done until approved equipment submittals are in the hands of the contractors. It shall be the contractor's responsibility to obtain approved drawings and to make all connections, etc., in the neatest and most workmanlike manner possible. Each contractor shall coordinate with all other contractors having any connections, roughing-in, etc., to the equipment.
 - 3. In general, normal catalog information (with the particular items underlined or otherwise denoted as being the submitted item) will be acceptable as submittal data. Installation, operating and maintenance instructions must be that information, specifically applicable to the item furnished, ordinarily supplied with the equipment to the owner with any modifications indicated. Wiring diagrams must be correct for the application.

Generalized wiring diagrams, showing alternate methods of connection, will not be acceptable unless all unrelated sections are marked out.

- 4. Submittal data sheets, which indicate several different model numbers, figure numbers, optional accessories, installation arrangements, etc., shall be clearly marked to indicate the specific items of equipment to be furnished. Samples and certificates shall be furnished as requested. Submittal data must be complete for each piece of equipment; piecemeal data will not be processed.
- 5. It shall be noted that approval of shop drawings by the Engineer applies only to general design, arrangement, type, capacity and quality. Such approval doesn't apply to quantities, dimensions, connection locations and the like. In all cases, the contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, that all equipment fits the available space in a satisfactory manner, and that all connections are suitably located.
- 6. Before the project is accepted, all submittal data (shop drawings, etc.) must be complete and approved.
- 7. In addition to shop drawings described above, the following information is required of the contractor to be furnished to the Engineer.

1.23 HVAC DOCUMENT REQUIREMENTS

ITEM OR DESCRIPTION OF EQUIPMENT REQUIRING SHOP DRAWINGS	P L A I R S T T S	O M P A E N R U A A T L I N G	W D I I R A I G N R G A M	C E R T I F I C A T I O N	S A P L E S
Hangers and Supports	Х				
Identification	X				X
Insulations	X			X	
Ductwork & Accessories	X			X	
Diffusers and Grilles					
Hydronic Piping and Specialties	X	X		X	

1.24 OPERATION AND MAINTENANCE DATA

- A. Submit one electronic copy prior to final inspection in PDF format via email.
- B. Prepare with cover sheet titled "OPERATION AND MAINTENANCE INSTRUCTIONS". Title of project, and subject matter of binder when multiple binders are required.
- C. Divide PDF file into segments for each equipment type logically. Provide Table of Contents for reference.
- D. Part I: Directory, listing names, addresses, and telephone numbers of Architect/Engineer. Contractor, Subcontractors, and major equipment suppliers.
- E. Part 2: Operation and maintenance instructions, arranged by system and subdivided. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
 - 1. Significant design criteria.
 - 2. List of equipment
 - 3. Parts list for each component.
 - 4. Operating instructions.
 - 5. Maintenance instructions for equipment and systems.
 - 6. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
- F. Part 3: Project documents and certificates, including the following:
 - 1. Approved shop drawings and product data.
 - 2. Certificates.
 - 3. Photocopies of warranties and bonds.
- G. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection with Owner's comments. Revise content of documents as required prior to final submittal.
- H. Submit final volumes revised within ten days after final inspection.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 230000

SECTION 230500 - COMMON WORK RESULTS FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Grout.
 - 6. Equipment installation requirements common to equipment sections.
 - 7. Duct systems common requirements.
 - 8. Concrete bases.
 - 9. Supports and anchorages.

1.2 SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
- B. Welding certificates.

1.3 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

- 2.1 PIPE, TUBE, AND FITTINGS
 - A. Refer to individual piping Sections for pipe, tube, and fitting materials and joining methods.
 - B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Welding Filler Metals: Comply with AWS D10.12.
- F. Solvent Cements for Joining Plastic Piping:
 - 1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solderjoint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

2.4 SLEEVES

- A. Galvanized Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 10, galvanized, plain ends.
- B. Sleeves shall extend a minimum 8 inch above roof penetrations, 2 inch above floor penetrations, and 2 inch outside of wall penetrations (when concealed).

2.5 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, duct and insulation of insulated piping or duct and an OD that completely covers opening.
- B. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.

2.6 GROUT

- A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 4,000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved by the Engineer.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.

COMMON WORK RESULTS FOR MECHANICAL

- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and caulk. Select sleeve size to allow for 1/2-inch annular clear space between pipe and sleeve.
- O. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- Q. All exposed and concealed accessible piping installations shall be identified as to service flow and direction with lettering and flow arrows as specified. Piping shall be identified at prominent locations, but in no case at intervals greater than 50 feet.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Non-pressure Piping: Join according to ASTM D 2855.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible clearances.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces.
- C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.
- D. Install equipment to allow clearance for piping installed at required slope.
- E. All equipment shall be identified with unique equipment number and service as specified.

3.5 DUCT SYSTEMS - COMMON REQUIREMENTS

- A. Install duct according to the following requirements and Sections specifying duct systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct systems. Indicated locations and arrangements were used to size duct and calculate friction loss, expansion, fan sizing, and other design considerations. Install duct as indicated unless deviations to layout are approved by the Engineer.
- C. Install duct in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install duct indicated to be exposed and duct in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

- E. Install duct above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install duct to permit damper servicing.
- G. Install duct free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install duct to allow application of insulation.
- J. Install sheetmetal flanges for penetrations of walls, ceilings, and floors.
- K. Install sleeves for duct passing through masonry walls and gypsum board walls extended to the structure above.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- N. Not all offsets, fittings, transitions, etc. are shown on the drawing for clarity. The Contractor shall furnish and install all material and labor required for a complete and fully functional system.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

- A. Clean surfaces that will come into contact with grout.
- B. Provide forms as required for placement of grout.
- C. Avoid air entrapment during placement of grout.
- D. Place grout around anchors.
- E. Cure placed grout.

END OF SECTION 230500

SECTION 230553 - IDENTIFICATION FOR MECHANICAL PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 SUBMITTAL

- A. Product Data: For each type of product indicated.
- B. Sample: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 2-1/2 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds the size of principal lettering.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's unique equipment number and service (ex. EF-2: Restroom 203 Fan).
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and service. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 2-1/2 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. 2 NPS and larger. Pre-tensioned Pipe Labels: Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. 1-1/2 NPS and Smaller. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Hydronic Supply and Return
 - a. Background Color: Green.
 - b. Letter Color: White.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
 - 1. Air Systems:
 - a. Constant-volume air systems.
 - 2. Hydronic Piping Systems:
 - a. Constant-flow systems.
 - 3. HVAC equipment quantitative-performance settings.
 - 4. Verifying that automatic control devices are functioning properly.
 - 5. Reporting results of activities and procedures specified in this Section.

1.2 SUBMITTALS

- A. Strategies and Procedures Plan: Within 60 days from Contractor's Notice to Proceed, submit 2 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.
- B. Certified TAB Reports: Submit electronic (PDF format) copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.
- C. Warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. TAB Firm Qualifications: Engage a TAB firm certified by AABC.
- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

1.4 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

1.6 WARRANTY

- A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
 - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
 - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' design that may preclude proper TAB of systems and equipment.
 - 1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flowcontrol devices and fittings and manual volume dampers are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine Project Record Documents.
- D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.
- F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- G. Examine system and equipment test reports.
- H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, and manual volume dampers are properly installed and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- K. Examine terminal units, such as water-source heat pumps, to verify that they are accessible and their controls are connected and functioning.
- L. Examine strainers for clean screens and proper perforations.
- M. Examine control valves for proper installation and for performance of their intended function.
- N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- O. Examine system pumps to ensure absence of entrained air in the suction piping.
- P. Examine equipment for installation and for properly operating safety interlocks and controls.
- Q. Examine automatic temperature system components to verify the following:
 - 1. Dampers, valves, and other controlled devices are operated by the intended controller.
 - 2. Dampers and valves are in the position indicated by the controller.
 - 3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions.
 - 4. Automatic modulating and shutoff valves are properly connected.
 - 5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 - 6. Sensors are located to sense only the intended conditions.
 - 7. Sequence of operation for control modes is according to the Contract Documents.
 - 8. Controller set points are set at indicated values.

- 9. Interlocked systems are operating.
- 10. Changeover from heating to cooling mode occurs according to indicated values.
- R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

- C. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and economizer dampers.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.
- H. Check condensate drains for proper connections and functioning.
- I. Check for proper sealing of air-handling unit components.
- J. Check for proper sealing of air duct system.
- K. Measure air leakage per Section "Metal Ducts".

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - 2. Measure static pressure across each component that makes up an air-handling unit.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as heat recovery equipment under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor

amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Re-measure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.
 - 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers.
 - 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 - 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
- B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
 - 1. Open all manual valves for maximum flow.
 - 2. Check expansion tank liquid level.
 - 3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
 - 4. Check flow-control valves for specified sequence of operation and set at indicated flow.
 - 5. Set differential-pressure control valves at the specified flow rate.
 - 6. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
 - 7. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures:
 - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
 - 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 - 4. Report flow rates that are not within plus or minus 5 percent of design.
- B. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump head, and systems' pressure and temperature including outdoor-air temperature.
- C. Record the differential-pressure control valve settings existing at the conclusion of balancing activities.

3.8 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer, model, and serial numbers.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Efficiency rating.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Water Coils: Measure the following data for each coil:
 - 1. Entering- and leaving-water temperature.
 - 2. Water flow rate.
 - 3. Water pressure drop.
 - 4. Dry-bulb temperature of entering and leaving air.

- 5. Wet-bulb temperature of entering and leaving air for cooling coils.
- 6. Airflow.
- 7. Air pressure drop.
- B. Refrigerant Coils: Measure the following data for each coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.
 - 3. Airflow.
 - 4. Air pressure drop.
 - 5. Refrigerant suction pressure and temperature.

3.10 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.11 TEMPERATURE-CONTROL VERIFICATION

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Check free travel and proper operation of control devices such as damper and valve operators.
- D. Check the interaction of interlock and lockout systems.
- E. Note operation of electric actuators using spring return for proper fail-safe operations.

3.12 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Minus 10 to plus 10 percent.
 - 2. Air Outlets and Inlets: Minus 10 to plus 10 percent.
 - 3. Condenser-Water Flow Rate: Minus 0 to plus 5 percent.

3.13 FINAL REPORT

- A. General: Typewritten, or computer entered in letter-quality font, electronic PDF file, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of PDF signed and sealed by the certified testing and balancing engineer.
 - 1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
 - 1. Pump curves.
 - 2. Fan curves.
 - 3. Manufacturers' test data.
 - 4. Field test reports prepared by system and equipment installers.
 - 5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
 - 1. Title page.
 - 2. Name and address of TAB firm.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB firm who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports varies from indicated values.
 - 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.

- e. Settings for supply and exhaust air static-pressure controller.
- f. Other system operating conditions that affect performance.

3.14 ADDITIONAL TESTS

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
 - 2. Adhesives.
 - 3. Sealants.
 - 4. Factory-applied jackets.
 - 5. Tapes.
 - 6. Securements.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at pipe expansion joints for each type of insulation.
 - 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 5. Detail field application for each equipment type.
- C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-testresponse characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armacell LLC.
 - b. RBX Corporation.
 - c. Approved equal.
- E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type III with factory applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville.
 - b. Knauf Insulation.
 - c. Owens Corning.
 - d. Approved equal.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville.
 - b. Knauf Insulation.
 - c. Owens Corning.
 - d. Approved equal.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to it and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- C. ASJ and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 SEALANTS

- A. FSK Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
- B. ASJ and PVC Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.4 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.5 FIELD-APPLIED JACKETS

- A. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Adhesive: As recommended by jacket material manufacturer.
 - 2. Color: White.
 - 3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricated.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, unions, etc.

2.6 TAPES

- A. ASJ and PVC Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90-ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 6.5 mils.
 - 3. Adhesion: 90-ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Width: 3 inches.
 - 2. Thickness: 3.7 mils.
 - 3. Adhesion: 100-ounces force/inch in width.
 - 4. Elongation: 5 percent.
 - 5. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020-inch thick, ³/₄-inch wide with wing or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with mechanical staples and adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

- 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof, Floor, Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through penetrations.

3.4 PENETRATIONS THROUGH FIRE-RATED ASSEMBLIES

- A. Insulation Installation at Fire-Rated Wall and Partition Penetrations:
 - 1. Duct: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
 - 2. Pipe: Install insulation continuously through penetrations of fire-rated walls and partitions.

- B. Insulation Installation at Floor Penetrations:
 - 1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Pipe: Install insulation continuously through floor penetrations.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 7. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at in-line instruments, control valves, and unions. Installation shall conform to the following:
 - 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 - 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:

- 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
- 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- 3. Install insulation to flanges as specified for flange insulation application.
- 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 - 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

- 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
- 4. Install insulation to flanges as specified for flange insulation application.
- E. Blanket Insulation Installation on Ducts: Secure with adhesive and insulation pins.
 - 1. For ducts with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vaporbarrier seal.
 - 2. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 - 3. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 - 4. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation in Return-Air Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install capacitor-discharge-weld pins and speed washers as follows:
 - a. On plenum sides with dimensions of 12 inches: Place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. Do not over-compress insulation during installation.
 - c. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be

limited to two location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

- 2. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two locations of straight pipe, two locations of threaded fittings, two locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, two locations of threaded valves, and two locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
- 3.9 DUCT INSULATION SCHEDULE, GENERAL
 - A. Ducts Devices Requiring Insulation:
 - 1. Indoor supply and exhaust-air ducts.
 - 2. Diffuser and grille backs.
 - 3. Return-air plenums.
 - B. Items Not Insulated:
 - 1. Factory-insulated flexible ducts.
 - 2. Flexible connectors.
 - 3. Vibration-control devices.
 - 4. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND TERMINAL DEVICES INSULATION SCHEDULE

- A. Concealed, Supply and Exhaust-Air Duct Insulation: Mineral-fiber blanket with factory-applied FSK Jacket, 2.2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Diffuser Backs Insulation: Mineral-fiber blanket with factory-applied FSK Jacket, 2.2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Return-Air Plenum Insulation: Mineral-fiber Liners, 1 inch thick and 3.8-lb/cu. ft. nominal density.

3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Piping and Components Requiring Insulation:

- 1. ADA guards.
- 2. Hydronic piping.
- C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Underground piping.
 - 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

END OF SECTION 230700

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
 - 1. Condenser-water piping.
 - 2. Air-vent piping.
 - 3. Glycol.
- B. Refer to Section "HVAC Water Treatment" for Additional Information.
- C. Contractor shall provide propylene glycol for existing system to provide necessary freeze protection.

1.2 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
 - 1. Condenser-Water Piping: 150 psig at 150 deg F.
 - 2. Air-Vent Piping: 200 deg F.

1.3 SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Pipe and fittings.
 - 2. Air control devices.
 - 3. Chemical treatment.
 - 4. Hydronic specialties.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B88, Type L.
- B. Wrought-Copper Fittings: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- C. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Tyco Fire & Building Products.
 - c. Victaulic Company of America.
 - d. Approved equal.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47, Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- D. Branch Line Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Tyco Fire & Building Products.
 - c. Victaulic Company of America.
 - d. Approved equal.

- 2. Pressure Rating: 175 psig minimum.
- 3. Body Material: Steel
- 4. Type: Weld-o-lets or thread-o-lets.
- 5. Configurations: Fully welded to main, with welded or threaded connection. Refer to "Piping Applications" for connection method.
- 6. Size: Of dimension to fit onto hydronic main and with outlet connections as required to match connected branch piping.
- 7. Branch Outlets: Grooved or threaded.

2.3 JOINING MATERIALS

- A. Joining materials as specified in Section "Common Work Results for Mechanical".
- 2.4 DIELECTRIC FITTINGS
 - A. Dielectric Fittings are specified in Section "Common Work Results for Mechanical".

2.5 AIR CONTROL DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amtrol, Inc.
 - 2. Armstrong Pumps, Inc.
 - 3. Bell & Gossett.
 - 4. Patterson Pump Company.
 - 5. Approved equal.
- B. Manual Air Vents:
 - 1. Body: Cast Iron.
 - 2. Internal Parts: Nonferrous.
 - 3. Operator: Screwdriver or thumbscrew.
 - 4. Inlet Connection: NPS 1/2.
 - 5. Discharge Connection: NPS 1/8.
 - 6. CWP Rating: 150 psig.
 - 7. Maximum Operating Temperature: 225 deg F.

2.6 HYDRONIC PIPING SPECIALTIES

- A. Stainless-Steel Bellow, Flexible Connectors:
 - 1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
 - 2. End Connections: Threaded or flanged to match equipment connected.
 - 3. Performance: Capable of 3/4-inch misalignment.

- 4. CWP Rating: 150 psig.
- 5. Maximum Operating Temperature: 250 deg F.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Condenser-water piping, aboveground, NPS 2-1/2 and larger, shall be the following:
 - 1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- B. Air-Vent Piping:
 - 1. Inlet: Same as service where installed.
 - 2. Outlet: Type K, annealed-temper copper tubing with soldered joints.
- C. Make-up water for fluid cooler, underground shall be the following:
 - 1. Schedule 40, PVC, with solvent welded joints and fittings.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment as specified.

3.3 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.

HYDRONIC PIPING

- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using manufactured fittings in main pipe, with the branch connected to the main pipe.
- P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- R. Identify piping as to contents and flow direction as specified in Section "Identification for Mechanical Piping and Equipment".

3.4 HANGERS AND SUPPORTS

- A. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping.
 - 2. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 1/2 inch.
 - 2. NPS 3: Maximum span, 12 feet; minimum rod size, 1/2 inch.
 - 3. NPS 4: Maximum span, 8 feet; minimum rod size, 5/8 inch.
 - 4. NPS 6: Maximum span, 8 feet, minimum rod size, 3/4 inch.
 - 5. NPS 8: Maximum span, 19 feet, minimum rod size, 7/8 inch.
 - 6. NPS 10: Maximum span, 20 feet, minimum rod size, 7/8 inch.
- C. Support PVC piping per Manufacturer's recommended spacing.

3.5 PIPE JOINT CONSTRUCTION

A. Pipe joint construction is specified in Section "Common Work Results for Mechanical".

3.6 HYDRONIC SPECIALTIES INSTALLATION

- A. Install manual air vents at all high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.
- B. Install piping from air separator or air purger to expansion tank with a 2 percent upward slope toward tank.
- C. Install bypass chemical feeder in hydronic system where indicated, in upright position with top of funnel not more than 48 inches above the floor. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

3.7 CHEMICAL TREATMENT

- A. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.
- B. Add initial chemical treatment and maintain water quality in ranges noted above for the first twelve (12) months of operation. Reference Section "HVAC Water Treatment".
- C. Fill system with glycol solution with the following concentrations:
 - 1. Condenser-Water Piping: Minimum twenty (20) percent propylene glycol.
 - 2. Refer to drawings for approximate sizing of hydronic piping systems.

3.8 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints un-insulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 - 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or another source of overpressure during test.

- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Isolate expansion tanks and determine that hydronic system is full of water.
 - 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
 - 6. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Inspect pumps for proper rotation.
 - 3. Set makeup pressure-reducing valves for required system pressure.
 - 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 - 5. Set temperature controls so all coils are calling for full flow.
 - 6. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 233113 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rectangular ducts and fittings.
 - 2. Round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible".
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards Metal and Flexible".

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Fittings.
 - 2. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel," for hangers and supports.
 - 2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 1-5, "Longitudinal Seams Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-2, "Transverse Joints Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-1, "Seams Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

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- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- F. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal

flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 SEAM AND JOINT SEALING

- A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.
- B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors.
- B. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

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3.5 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
- C. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 - 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.

D. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: 45-degree entry.
- 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible."
 - a. Round main to Round Branch: 45-degree lateral.
 - b. Saddle taps are not permitted.
 - c. 90 deg conical tees are not permitted.

END OF SECTION 233113

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Fire Dampers.
 - 3. Flexible connectors.
 - 4. Flexible ducts.
 - 5. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 FIRE DAMPERS

- A. Type: Static; rated and labeled according to UL 555 by an NRTL.
- B. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.
- C. Fire Rating: 1-1/2 hours.
- D. Frame: Curtain Type A with blades inside airstream; fabricated with roll-formed, galvanized steel; with mitered and interlocking corners; gauge in accordance with UL listing.
- E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel; gauge in accordance with UL listing.
- F. Mounting Orientation: Vertical or horizontal as indicated.
- G. Blades: Roll-formed, interlocking, galvanized sheet steel; gauge in accordance with UL listing.
- H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- I. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- J. Heat-Responsive Device: Replaceable link and switch package, factory installed, 165 deg F rated.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Hat-shaped, galvanized-steel channels, 20 ga. minimum.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:
- a. Molded synthetic.
- b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
- 7. Tie Bars and Brackets: Galvanized steel.
- 8. Two-inch standoff with locking nut.

2.4 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.5 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation Value: R-6.0 minimum.
- B. Flexible Duct Connectors:
 - 1. Clamps: Nylon strap in sizes 3 through 8 inches, to suit duct size.

2.6 DUCT ACCESSORY HARDWARE

A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.
- C. Install volume dampers at points on supply, return, outside and exhaust systems where branches extend from larger ducts.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install flexible connectors to connect ducts to equipment. Maximum length of flexible connectors shall be 6 inches.
- F. Connect diffusers to low-pressure ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- G. Connect flexible ducts to metal ducts with draw bands.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect turning vanes for proper and secure installation.

SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Flexible connectors.
 - 3. Flexible ducts.
 - 4. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Standard leakage rating, with linkage outside airstream.
 - 2. Suitable for horizontal or vertical applications.
 - 3. Frames:
 - a. Hat-shaped, galvanized-steel channels, 20 ga. minimum.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 4. Blades:
 - a. Multiple or single blade.
 - b. Opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 5. Blade Axles: Galvanized steel.
 - 6. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 7. Tie Bars and Brackets: Galvanized steel.
 - 8. Two-inch standoff with locking nut.

2.3 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.4 FLEXIBLE DUCTS

- A. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation Value: R-6.0 minimum.
- B. Flexible Duct Connectors:
 - 1. Clamps: Nylon strap in sizes 3 through 8 inches, to suit duct size.

2.5 DUCT ACCESSORY HARDWARE

A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards Metal and Flexible" for metal ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.
- C. Install volume dampers at points on supply, return, outside and exhaust systems where branches extend from larger ducts.
 - 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install flexible connectors to connect ducts to equipment. Maximum length of flexible connectors shall be 6 inches.
- F. Connect diffusers to low-pressure ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.
- G. Connect flexible ducts to metal ducts with draw bands.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

AIR DUCT ACCESSORIES

- 1.
- Operate dampers to verify full range of movement. Inspect turning vanes for proper and secure installation. 2.

SECTION 233713 - DIFFUSERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Diffusers and grilles.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser and Grille Schedule: Indicate drawing designation, quantity, model number, size, and accessories furnished.
- B. Samples: For each color specified.

PART 2 - PRODUCTS

2.1 DIFFUSERS AND GRILLES

- A. Diffusers and Grilles, as specified on drawings:
 - 1. Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Nailor Industries.
 - c. Price Industries.
 - d. Titus.
 - e. Approved equal.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers and grilles level and plumb.
- B. Ceiling- and Wall-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where Architectural features or other items conflict with installation, notify Engineer for a determination of final location.
- C. Install diffusers and grilles with airtight connections to ducts and to allow service and maintenance of volume and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers and grilles to air patterns indicated, or as directed, before starting air balancing.

SECTION 260000 - GENERAL PROVISIONS FOR ELECTRICAL

PART 1 – GENERAL

1.1 SCOPE

- A. Special Conditions section and General Requirements section are made part of this Division.
- B. This Division includes the sections, but not necessarily limited to, listed in the Division Table of Contents.

1.2 GENERAL

- A. The work included in this division consists of furnishing all labor, equipment, transportation, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Electrical System(s) indicated or specified in the Contract Documents.
- B. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Electrical Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and/or specifications, shall be included as part of this Contract.
- C. It is the intent of this Contract to deliver to the Owner's a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing items which interfere with the new work required for the complete installation without additional cost to the Owner.

1.3 INTENT

- A. It is the intention of the Contract Documents to call for finished work, tested and ready for operation.
- C. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

1.4 EXAMINATION OF SITE AND CONDITIONS

A. Each Proposer shall inform himself of all conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. Each Proposer shall also fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of utilities, etc. His proposal shall cover all

expenses or disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after bids are accepted.

1.5 DRAWINGS AND SPECIFICATIONS

- A. The drawings are diagrammatic only and indicate the general arrangement of the work to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item, which may be necessary to complete the systems. All Proposers shall anticipate that additional items may be required and submit their bid accordingly.
- B. The drawings and specifications are intended to supplement each other. No Proposer shall take advantage of conflict between them, or between parties of either. Should this condition exist, the Proposer shall request a clarification not less than twelve days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.
- C. The drawings and specifications shall be considered to be cooperative and anything appearing in the specifications, which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.
- D. The Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.
- E. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.
- F. Should conflict or overlap (duplication) of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.
- G. Unless dimensioned, the drawings only indicate approximate locations. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to insure no conflict with other work.
- H. Where on the Drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.
- I. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

- J. Where on the Contract Documents the word typical is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.
- K. Special Note: Always check ceiling heights indicated on Architectural Drawings and Schedules and ensure that they may be maintained after all mechanical and electrical equipment is installed. Do not install equipment in the affected area until the conflict is resolved.

1.6 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- A. By execution of this Contract, the Contractor warrants that he has visited the site of the proposed work, and fully acquainted himself with the conditions there existing relating to construction and labor and that he fully understands the facilities, difficulties, and restrictions attending the execution of the work under Contract. The Contractor further warrants that he has thoroughly examined and is familiar with the drawings, specifications and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract, his failure, when he was bidding on this Contract, to receive or examine any form, instrument, or document, or to visit the site and acquaint himself with the conditions there existing, in no way relieves the Contractor. The Contractor agrees that the Owner shall be justified in rejecting any claim based on facts regarding conditions for which he should have been on prior notice.
- B. Before ordering material or performing any work, the Contractor shall verify all measurements at the work site. Any difference between dimensions on the Drawings and actual measurements shall be brought to the Engineer's attention for his consideration before the work may proceed. No extra compensation will be allowed because of difference between actual measurements and dimensions indicated on the Drawings. The Contractor shall assume full responsibility for accuracy of measurements obtained at the Work Site.
- C. Dimensions, which are lacking, shall be obtained from the Architect. In no case shall Drawings be scaled.
- D. All subcontractors shall familiarize themselves with all of the conditions relating to this Contract since the terms set forth in the General Conditions binds all subcontractors to the Contract.

1.7 WORK LAYOUT

- A. This contractor shall layout his work from construction lines and levels established by the General Contractor and shall be responsible for the proper location and placement of his work.
- B. Maintain all benchmarks, monuments, and other reference points; replace as directed if disturbed or destroyed.
- 1.8 PROTECTION OF STORED EQUIPMENT
 - A. Provide suitable storage for, and completely protect all materials and equipment prior to installation. Storage shall be dry, clean and safe. Any materials or equipment damaged, deteriorated, rusted or defaced due to improper storage shall be fully repaired, refinished or

replaced, as directed by the Engineer and any materials or equipment lost through theft or mishandling shall be replaced, all without additional cost to the Owner.

1.9 COORDINATION BETWEEN TRADES

- A. Each Proposer shall review all drawings and specifications including Architectural, Mechanical, Electrical, Fire Protection, Landscaping, Structural, Surveys, etc., to ensure that the work he intends to provide does not encroach a conflict with or affect the work of others in any way. Where such effect does occur, it shall be the Proposer's responsibility to satisfactorily eliminate any such encroachment conflict or effect prior to the submission of his proposal. Each Proposer shall in particular ensure that there is adequate space to install his equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded to the Proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to insure adequate spaces.
- B. It shall be the responsibility of this contractor to leave the necessary room for other trades. No extra compensation will be allowed to cover the cost of relocating conduit, boxes, etc., or equipment found encroaching on space required by others.

1.10 EQUIPMENT CONNECTIONS AND WIRING

- A. This contractor shall make all electrical connections, etc., to equipment furnished by others whenever such equipment is shown on any part of the drawings or mentioned in any section of the specifications, unless otherwise specified.
- B. Supervision, to assure proper functioning and operation shall be provided by the trade furnishing the equipment or apparatus so connected.
- C. Unless otherwise specifically noted on the drawings or elsewhere in these specifications, all wiring shall be done by this contractor, including connections, etc., to all equipment requiring electrical services furnished under other sections of this specification. This contractor shall furnish and install all disconnects, overload protection, motor control apparatus, etc., for all equipment unless otherwise specifically noted elsewhere as being provided with, or as a part of, the equipment.

1.11 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. When this contractor requests approval of substitute materials and/or equipment, except when under formal alternate proposal, it shall be understood and agreed that such substitution, if approved, will be made without cost to the Owner or Engineer, regardless of changes in connections, spacing, electrical services, etc. In all cases where substitutions affect other trades, the contractor offering such substitutions shall reimburse all affected contractors for all necessary changes in their work.

1.12 CODES AND STANDARDS

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598 Elevator Addition Union County Courthouse Morganfield, Kentucky

- A. Pertinent Federal, State and Local requirements and regulations are hereby made part of this contract. In case of conflict between Contract Documents and above listed requirements, the latter shall govern. Requirements of authority having local jurisdiction shall supersede all other requirements. Use of the term "code" in sections of the specification refers to applicable requirements and regulations of above agencies.
- B. All electrical installation shall be made in accordance with the latest edition of the National Electrical Code and supplements in force at the time of bid opening, all materials employed shall bear Underwriters' official labels where such labeling is customary. In the event that local codes are more rigid than the National Electrical Code, both codes shall be considered as jointly governing and the requirements of either and/or both then prevail.
- C. Following is a list of abbreviations for codes and standards, which are referred to in the specifications. Where such reference is made, the code or standard becomes a part of the specification as if the code or standard were included herein. Reference is always to the latest edition of the code or standard unless otherwise specifically noted.
 - 1. Industry and Agency Standards, Codes and Specifications

ANSI - American National Standards Institution

ASTM - American Society of Testing and Materials

NBFU - National Board of Fire Underwriters'

NBS - National Bureau of Standards

NEMA - National Electrical Manufacturers Association

UL - Underwriters' Laboratories

NEC - National Electrical Code

NESC - National Electrical Safety Code

IPCEA - Insulated Power Cable Engineers Association

IEEE - Institute of Electrical and Electronics Engineers

D. Compliance with the Occupational Safety and Health Act shall be the responsibility of the contractor and under no circumstances shall the Engineer/Architect be an authority or be held responsible for any acts concerning this regulation.

1.13 MATERIALS AND EQUIPMENT

A. General. Material and equipment shall be furnished as specified in this section and in each individual electrical section of these specifications and shall be in strict accordance with the required ANSI, ASTM, NEMA, IPCEA, UL, NEC, or other recognized standards, codes and specifications listed. Applicable codes, standards and manufacturers' products referred to in these specifications shall establish minimum requirements for material, equipment and installation furnished.

- B. Bolting shall be carbon steel conforming to ASTM A-307 with heavy hexagonal nut.
- C. Angles, Channels, Beams, Bars and Rods shall be steel conforming to ASTM A-36.

1.14 INSTALLATION

- A. Installation of all electrical equipment for the project as specified in these specifications and indicated on the drawings shall be in accordance with the general requirements of this section. Additional installation requirements applicable to individual systems are specified in the specific system section.
- B. All equipment shall be installed at locations indicated on the drawings and as specified herein.
- C. Assembly and installation of equipment shall be in strict accordance with manufacturer's installation instructions.
- D. Equipment shall be securely anchored in place. Care shall be exercised to correctly orient equipment before securing in place.
- E. All equipment and material shall meet the minimum requirements of seismic bracing as governed by the authority having jurisdiction.

1.15 OBSOLETE OR REMOVED EQUIPMENT AND MATERIALS

- A. The Electrical Contractor shall remove all existing materials and equipment made obsolete by, and interfering with the additions, alterations, or razing as shown on the plans and specified. Maintain such existing equipment and materials intact and in existing condition insofar as possible.
- B. Unless otherwise specifically stated in the specifications or shown on the drawings, all such removed material and equipment, not to be reused, shall be removed from the site and disposed of in a proper manner.

1.16 CONTINUOUS OPERATION AND CUT-OVER

- A. The present services, facilities, or equipment shall be left intact until such time that the new permanent installation is completed, or temporary means provided for continuous operation.
- B. All new services, equipment, etc., for the new installation shall be installed complete to a point of connection before attempting to make new connections.
- C. To facilitate the continuous operation of the system and building, the cut-over work shall be done at off-peak periods. Such periods to be arranged by conference between the Contractor, Owner and the Engineer. All contractors shall rigidly adhere to the program so determined.

D. All material installed shall meet the minimum requirements of the Local Code for seismic bracing and be installed in such a manner suitable for the seismic zone which applies.

1.17 TESTS

A. Following the completion of all wiring installation, test the individual systems and eliminate any existing grounding of potential conductors, short circuits, other faults, etc.

1.18 PERMITS, FEES AND CERTIFICATES

A. Each respective contractor shall obtain and pay all permits and licenses required by Federal, State and Local Ordinances for his type work. All fees in connection with inspections, permits, licenses and approvals shall be paid by the contractor whose work is affected.

1.19 ELECTRICAL INSPECTION FOR CONTRACT COMPLIANCE

A. The contractor shall be responsible for obtaining and coordination of required electrical inspections and any fees and charges associated with the inspections. Inspections shall be made by an Electrical Inspector Certified by the authority having jurisdiction. The contractor shall furnish the Engineer and Owner a copy of the Electrical Certificate of approval before final payment will be made.

1.20 PROJECT CLEAN-UP

- A. The Contractor shall export off site, all debris resulting from work under this Division. Burning of debris at the project site is not permitted.
- B. Each contractor shall maintain his portion of this project in a neat and orderly fashion, disposing of debris, cartons, crates and boxes as the contents are installed in the project. This clean-up shall be accomplished each day in order not to create hardships on the other trades.

1.21 GUARANTEES AND WARRANTIES

A. This Contractor shall guarantee all equipment, apparatus, materials and workmanship entering into this contract to be the best of its respective kind, and shall replace all parts at his own expense, which have been proven defective, within one year from final acceptance of the work by the Owner. Items of equipment, which may have longer guarantees, shall have warranties and guarantees completed, in order, and in effect at the time of final acceptance of the work by the Architect. This contractor shall furnish all such warranties and guarantees at the time of final acceptance of the work.

1.22 SHOP DRAWINGS AND OTHER RELATED SUBMITTALS

- A. The type of submittal information required for each item of equipment is scheduled at the end of this section. Unless noted otherwise, submittals shall be furnished in electronic format. The Contractor shall furnish a single pdf file for each submittal. Submittals shall be clearly labeled as to what is contained within and shall note the related Specification Section. The Contractor shall be responsible for providing a numbering convention for submittals to allow easy tracking of submittals.
- B. Submittals for color selections shall not be electronically submitted. Provide hard copies of the colors. Printed color selections are not acceptable.
- C. Unless otherwise specified, materials and equipment must be a standard product of manufacturers regularly engaged in production of such items.
 - 1. The contractor shall secure right to use any patented article, method or apparatus used in work.
 - 2. When substitute item of equipment has been submitted for approval, the mechanical contractor shall submit layout drawings indicating the changes necessary to adapt the substitute item of equipment to the design, when requested by the Engineer. All cost of the requested drawings shall be the responsibility of the contractor offering the substitutions.
 - 3. Under no circumstances will materials be considered for substitution, which are not a product of a manufacturer regularly engaged in production of such material or which is a product of one who merely assembles products of other manufacturers into fabricated units. Material submitted for substitution shall be subject to express and implied warranties of one manufacturer only.
- D. If substitution of material results in incidental extra costs on part of any trade under contract, such costs shall be borne by contractor desiring substitution.
 - 1. Submittal data shall include specification data, such as metal gauges, finishes, optional accessories, etc., even though such equipment and materials may be detailed on the drawings or specified. In addition, the submittal data shall include performance (certification) data, wiring diagrams where applicable, accurate dimensional data and a recommended spare parts list. Outline or dimensional drawings alone are not acceptable.
 - 2. No roughing-in connections, etc., shall be done until approved equipment submittals are in the hands of the contractors. It shall be the contractor's responsibility to obtain approved drawings and to make all connections, etc., in the neatest and most workmanlike manner possible. Each contractor shall coordinate with all other contractors having any connections, roughing-in, etc., to the equipment.
 - 3. In general, normal catalog information (with the particular items underlined or otherwise denoted as being the submitted item) will be acceptable as submittal data. Installation, operating and maintenance instructions must be that information, specifically applicable to the item furnished, ordinarily supplied with the equipment to the owner with any modifications indicated. Wiring diagrams must be correct for the application. Generalized wiring diagrams, showing alternate methods of connection, will not be acceptable unless all unrelated sections are marked out.

- 4. Submittal data sheets, which indicate several different model numbers, figure numbers, optional accessories, installation arrangements, etc., shall be clearly marked to indicate the specific items of equipment to be furnished. Samples and certificates shall be furnished as requested. Submittal data must be complete for each piece of equipment; piecemeal data will not be processed.
- 5. It shall be noted that approval of shop drawings by the Engineer applies only to general design, arrangement, type, capacity and quality. Such approval doesn't apply to quantities, dimensions, connection locations and the like. In all cases, the contractor alone shall be responsible for furnishing the proper quantity of equipment and/or materials required, that all equipment fits the available space in a satisfactory manner, and that all connections are suitably located.
- 6. Before the project is accepted, all submittal data (shop drawings, etc.) must be complete and approved.
- 7. In addition to shop drawings described above, the following information is required of the contractor to be furnished to the Engineer.

1.23 ELECTRICAL DOCUMENT REQUIREMENTS

ITEM OR DESCRIPTION OF EQUIPMENT REQUIRING SHOP DRAWINGS	P A T S	L I S T	O P E R A T I N G	M A U A L	W I R I N G	D I A G R A M	C E R T I F I C A T I O N	S A M P L E S
Lighting Fixtures/Poles								
Switchboards								
Panelboards								
Wiring Devices								
Enclosed Switches and Circuit Breakers								
Heat Tracing for Piping			2	X	2	X		
Enclosed Controller (motor starters)					2	X		
Transformers					2	X		
Transient-Voltage Suppression Devices					2	X		
Fire Alarm System						X	Х	

1.24 OPERATION AND MAINTENANCE DATA

- A. The Contractor shall submit a single copy of the Operation and Maintenance Manuals prior to final completion.
- B. Operation and Maintenance Manuals (O&M's) shall be submitted in electronic format. Provide one pdf file per Specification Division.
- C. Prepare pdf files with the title for each file to include the Specification Division Number and brief description of contents (example: "Division 23 HVAC Equipment").
- D. The first page of pdf file shall be a coversheet titled "Operation and Maintenance Manual". Include table of contents with page numbers. Provide bookmarks within the pdf file labeled for each section contained within the file.
- E. Include the following within O&M's
 - 1. Part I: Directory, listing names, addresses, and telephone numbers of Architect/Engineer. Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Power quality test results (including any required grounding tests).
 - c. Certificates.
 - d. Photocopies of warranties and bonds.
- F. Submit one copy of completed pdf's in final form on DVD or solid-state media fifteen (15) days prior to final inspection. This copy will be returned after final inspection with Owner's comments. Revise content of documents as required prior to final submittal.
- G. Submit final pdf's revised within ten (10) days after final inspection. Provide at minimum three (3) DVD or solid-state copies.

1.25 TRAINING/INSTRUCTION

A. General Operating/Maintenance Instruction: Arrange for each installer of work requiring continuing maintenance or operation, to meet with the Owner's personnel, at project site, to

provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentations, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shutdown, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable Warranties, Agreements to Maintain, Bonds, and similar continuing commitments.

- 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.
- C. Training Modules: Develop a learning objective and teaching outline for each module. Include description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
 - 2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
 - 3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
 - 4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
 - 5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
 - 6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
 - 7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
 - 8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- C. Cut sleeves to length for mounting flush with both surfaces of walls.
- D. Extend sleeves installed in floors 2 inches above finished floor level.
- E. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- F. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".
- H. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.3 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Fire-alarm wire and cable.
 - 4. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2, and 3 control cables.
 - 2. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. Cerro Wire LLC.
 - 3. Southwire Company.
 - 4. Approved Equal.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

- 2. RoHS compliant.
- 3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B496 for stranded conductors.
- E. Conductor Insulation:1. Type THHN and Type THWN-2: Comply with UL 83.

2.2 METAL-CLAD CABLE, TYPE MC

- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Belden Inc.
 - 3. Southwire Company.
 - 4. Approved Equal.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Comply with UL 1569.
 - 3. RoHS compliant.
 - 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Circuits:
 - 1. Single circuit and multi-circuit with color-coded conductors.
 - 2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.
- E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.
- F. Ground Conductor: Insulated.
- G. Conductor Insulation:
 - 1. Type TFN/THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- H. Armor: Steel, interlocked.

2.3 FIRE-ALARM WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Wire & Cable Inc.
 - 2. CommScope, Inc.
 - 3. Superior Essex Inc.
 - 4. Approved Equal.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.4 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M Electrical Products.
 - 2. Hubbell Power Systems, Inc.
 - 3. Ideal Industries, Inc.
 - 4. Approved Equal.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; stranded minimum No. 12 AWG.

B. Branch Circuits: Copper. Copper; stranded minimum No. 12 AWG.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRING

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."
 - 1. Fire-alarm circuits and equipment control wiring associated with fire-alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
 - 1. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and

back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

3.5 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torquetightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.
- D. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advanced Lightning Technology, Ltd.
 - 2. Hubbell Incorporated (Construction and Energy Group).
 - 3. Thomas & Betts Corporation; A Member of the ABB Group.
 - 4. Approved Equal.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

2.4 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

- B. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- C. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- D. Conduit Hubs: Mechanical type, terminal with threaded hub.
- E. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Copper, stranded minimum No. 12 AWG.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors shall be connected to the ground bus.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.

3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

B. Grounding and Bonding for Piping:

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit and cable support devices.
 - 2. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- B. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Hilti, Inc.
 - 3) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 4) Approved Equal.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Hilti, Inc.
 - 3) ITW Ramset/Red Head; Illinois Tool Works, Inc.

- 4) Approved Equal.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 102.
 - 4. NECA 105.
 - 5. NECA 111.
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inchand smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.
3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, and Spring-tension clamps.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1. 1/2" minimum
- B. EMT: ANSI C80.3, 1/2" minimum
- C. FMC: Zinc-coated steel.
- D. LFMC: Flexible steel conduit with PVC jacket.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel, set-screw for conduits 2" and larger otherwise compression type.

2.2 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 or 3R, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type NEMA 1. Flanged-and-gasketed type NEMA 3R.
- E. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Engineer.
 - 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. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company (The).
 - c. Wiremold Company (The); Electrical Sales Division.
- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Engineer from manufacturer's standard colors.
 - 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. Butler Manufacturing Company; Walker Division.
 - b. Enduro Systems, Inc.; Composite Products Division.
 - c. Hubbell Incorporated; Wiring Device-Kellems Division.
 - d. Lamson & Sessions; Carlon Electrical Products.
 - e. Panduit Corp.
 - f. Walker Systems, Inc.; Wiremold Company (The).
 - g. Wiremold Company (The); Electrical Sales Division.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:

- 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
- 2. Hinged door in front cover with flush latch and concealed hinge.
- 3. Key latch to match panelboards.
- 4. Metal barriers to separate wiring of different systems and voltage.
- 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT or as indicated on the drawings.
 - 2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Raceways for Optical Fiber or Communications Cable: EMT.
 - 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- B. Minimum Raceway Size: 1/2-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. EMT: Compression type for all conduit less than 2" trade size.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in "Hangers and Supports for Electrical Systems."
- E. Install no more than the equivalent of four 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated. Conduit installed on liner panels shall be horizontal from the building eave down the panel, parallel to ribs, exposed to the terminating device. Conduit to serve devices in new masonry wall shall be concealed within the masonry and behind (concealed) the liner panel above.
- G. Raceway Terminations: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire label both ends.
- I. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- J. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall.

3.3 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in other sections of the specifications and on the drawings.

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Equipment identification labels.

1.2 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- 1.3 QUALITY ASSURANCE
 - A. Comply with ANSI A13.1.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

- C. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.3 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
 - 2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
 - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control

panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

- 1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
- 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Electrical switchgear and switchboards.
 - c. Transformers.
 - d. Motor-control centers.
 - e. Disconnect switches.
 - f. Enclosed circuit breakers.
 - g. Motor starters.
 - h. Push-button stations.
 - i. Power transfer equipment.
 - j. Contactors.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.

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SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Indoor occupancy sensors.
- B. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3 COORDINATION

- A. Coordinate lighting control components to form an integrated interconnection of compatible components.
- B. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - 1. Hubbell Lighting.
 - 2. Leviton Mfg. Company Inc.
 - 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 4. Novitas, Inc.
 - 5. RAB Lighting, Inc.
 - 6. Sensor Switch, Inc.
 - 7. TORK.
 - 8. Watt Stopper (The).
- C. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
 - 1. Operation: Unless otherwise indicated, lights are turned on by momentary contact wall switch and off when unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 - 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 - 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70. Auxiliary dry contacts to interface BAS.
 - 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 - 6. Bypass Switch: Override the on function in case of sensor failure.
 - 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
 - 8. Suitable for high humidity areas as indicated.
- D. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

- 1. Detector Sensitivity: Detect occurrences of 6-inch-minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
- 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
- 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10foot-high ceiling.
- 4. Auxiliary dry contacts to interface BAS.
- 5. Touch-Plate, Inc.
- 6. Watt Stopper (The).
- 7. Enclosure: Comply with NEMA 250.
- 8. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- 9. Or equal

2.2 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 22 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Include evidence of NRTL listing for SPD as installed in panelboard.
 - 7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 8. Include wiring diagrams for power, signal, and control wiring.
 - 9. Key interlock scheme drawing and sequence of operations.
 - 10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Top and Bottom.
- G. Phase, Neutral, and Ground Buses: Tin-plated aluminum.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Tin-plated aluminum.
 - 2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
- I. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections,

and other provisions for utility metering. Coordinate with utility company for exact requirements.

- J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- K. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include label or manual with size and type of allowable upstream and branch devices listed and labeled by an NRTL for series-connected short-circuit rating.
- L. Panelboard Short-Circuit Current Rating: Series rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton.
 - 2. General Electric Company; GE Energy Management Electrical Distribution.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; by Schneider Electric.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: **Bolt-on** circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. <Double click here to find, evaluate, and insert list of manufacturers and products.>
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with frontmounted, field-adjustable trip setting.

- 3. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.5 ACCESSORY COMPONENTS AND FEATURES

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NEMA PB 1.1.
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box.
- E. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

- H. Install filler plates in unused spaces.
- I. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard-grade receptacles, 125 V, 20 A.
 - 2. GFCI receptacles, 125 V, 20 A.
 - 3. Occupancy sensors.
 - 4. Wall plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Comply with NFPA 70.
- C. RoHS compliant.
- D. Comply with NEMA WD 1.
- E. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

- F. Wall Plate Color: For plastic covers, match device color.
- G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
 - 1. NFPA 70, "Tamper-Resistant Receptacles" Article.

2.2 GFCI RECEPTACLES, 125 V, 20 A

- A. Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated (Commercial and Industrial Group Wiring Device-Kellems).
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Square face.
 - 3. Configuration: NEMA WD 6, Configuration 5-15R.
 - 4. Type: Feed through.
 - 5. Standards: Comply with UL 498 and UL 943 Class A.
 - 6. Marking: Listed and labeled as complying with NFPA 70, "Weather-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 OCCUPANCY SENSORS

- A. Wall Switch Sensor Light Switch, Dual Technology:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Hubbell Incorporated (Commercial and Industrial Group Wiring Device-Kellems).
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
 - 3. Standards: Comply with UL 20.
 - 4. Rated 960 W at 120 V ac for tungsten lighting, 10 A at 120 V ac or 10 A at 277 V ac for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
 - 5. Adjustable time delay of 20 minutes.
 - 6. Connections: RJ-45 communications outlet.

2.4 RESIDENTIAL DEVICES

- A. Telephone Outlet:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton (Arrow Hart).
 - b. Leviton Manufacturing Co., Inc.
 - c. Approved Equal.
 - 2. Description: Single RJ-11 jack for terminating Category 5e, balanced twisted pair cable complying with Section 271513 "Communications Copper Horizontal Cabling."
 - 3. Standards: Comply with UL 1863.

2.5 WALL PLATES

- A. Single Source: Obtain wall plates from same manufacturer of wiring devices.
- B. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- C. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weatherresistant, die-cast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 3. Install wiring devices after all wall preparation, including painting, is complete.
- C. Device Installation:

- 1. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
- 2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- D. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Molded-case circuit breakers (MCCBs).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.
- B. Shop Drawings: For enclosed switches and circuit breakers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include wiring diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- C. Field quality-control reports.
- 1.4 CLOSEOUT SUBMITTALS
 - A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- C. Comply with NFPA 70.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ABB (Electrification Products Division).
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; by Schneider Electric.
- B. Circuit breakers shall be constructed using glass-reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
- C. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit-breaker tripping mechanism for maintenance and testing purposes.
- D. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker. Circuit breakers shall be series rated. Circuit breaker/circuit breaker combinations for

series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end-use equipment along with the statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

- E. MCCBs shall be equipped with a device for locking in the isolated position.
- F. Lugs shall be suitable for 140 deg F (60 deg C) rated wire on 125-A circuit breakers and below.
- G. Standards: Comply with UL 489 with interrupting capacity to comply with available fault currents.
- H. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads.
 - 3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

PART 3 - EXECUTION

3.1 ENCLOSURE ENVIRONMENTAL RATING APPLICATIONS

- A. Enclosed Switches and Circuit Breakers: Provide enclosures at installed locations with the following environmental ratings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.

3.2 INSTALLATION

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than seven days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Owner's written permission.
 - 4. Comply with NFPA 70E.
- B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- C. Comply with NFPA 70 and NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections for Molded Case Circuit Breakers:
 - 1. Visual and Mechanical Inspection:
 - a. Verify that equipment nameplate data are as described in the Specifications and shown on the Drawings.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, grounding, and clearances.
 - d. Verify that the unit is clean.
 - e. Operate the circuit breaker to ensure smooth operation.
 - f. Inspect bolted electrical connections for high resistance using one of the two following methods:
 - 1) Use a low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
 - g. Inspect operating mechanism, contacts, and chutes in unsealed units.
 - 2. Electrical Tests:
 - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 100.1 from the NETA ATS. Investigate

values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.

- c. Perform a contact/pole resistance test. Drop values shall not exceed the high level of the manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
 - 1) Instantaneous pickup. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances.
- d. Test functionality of the trip unit by means of primary current injection. Pickup values and trip characteristics shall be as specified and within manufacturer's published tolerances.
- e. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall be as indicated by manufacturer.
- 3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.
 - 1. Test procedures used.
 - 2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
 - 3. List deficiencies detected, remedial action taken, and observations after remedial action.

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the following types of LED luminaires:
 - 1. Recessed, linear.
 - 2. Surface mount, linear.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - 2. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
- C. Product Certificates: For each type of luminaire.
- D. Product test reports.
- E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.
 - 1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified and the luminaire will be fully operational during and after the seismic event."
- C. Ambient Temperature: 41 to 104 deg F (5 to 40 deg C).

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp characteristics:

a. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

2.3 RECESSED, LINEAR.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Lighting, an Eaton business.
 - 2. GE Lighting Solutions.
 - 3. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 4. Approved Equal.
- B. Nominal Operating Voltage: 120 V AC.
- C. Lamp:
 - 1. Minimum allowable efficacy of 85 lm/W.
 - 2. CRI of minimum 80. CCT of 4000 K.
 - 3. Rated lamp life of 50,000 hours to L70.
 - 4. Dimmable from 100 percent to 10 percent of maximum light output.
 - 5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- D. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Painted finish.
 - 3. With integral mounting provisions.
- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally when secured in operating position.
- F. Diffusers and Globes:
 - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- G. Standards:
 - 1. ENERGY STAR certified.
 - 2. RoHS compliant.
 - 3. UL Listing: Listed for damp location.
 - 4. NEMA LE 4.

2.4 SURFACE MOUNT, LINEAR.

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Lighting, an Eaton business.
 - 2. GE Lighting Solutions.
 - 3. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 4. Approved Equal.
- B. Nominal Operating Voltage: 120 V AC.
- C. Lamp:
 - 1. Minimum allowable efficacy of 85 lm/W.
 - 2. CRI of minimum 80. CCT of 4000 K.
 - 3. Rated lamp life of 50,000 hours to L70.
 - 4. Dimmable from 100 percent to 10 percent of maximum light output.
- D. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated
- E. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Painted finish.
 - 3. With integral mounting provisions.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally when secured in operating position.
- G. Diffusers and Globes:
 - 1. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.
- H. Standards:
 - 1. ENERGY STAR certified.
 - 2. RoHS compliant.
 - 3. UL Listing: Listed for damp location.

2.5 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.

LED INTERIOR LIGHTING

- 2. Sheet metal components shall be steel unless otherwise indicated.
- 3. Form and support to prevent warping and sagging.
- B. Steel:
 - 1. ASTM A36/A36M for carbon structural steel.
 - 2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:
 - 1. 1. Manufacturer's standard grade.
 - 2. 2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

2.6 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- 3.3 FIELD QUALITY CONTROL
 - A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
 - B. Luminaire will be considered defective if it does not pass operation tests and inspections.
 - C. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Comply with requirements for startup specified in Section 260943.16 "Addressable-Luminaire Lighting Controls."
PFGW File No. 1906 BFW File No. 19190 Marcum File No. 19598

SECTION 270000 - GENERAL PROVISIONS FOR COMMUNICATIONS

Reference Section 260000 - General Provisions for Electrical

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for pathways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common communications installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR PATHWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
- 3. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
- 4. Pressure Plates: Carbon steel. Include two for each sealing element.
- 5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications' equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.3 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Section 271513 "Communications Copper Horizontal Cabling" for copper data cabling associated with system panels and devices.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 2.2 BOXES, ENCLOSURES, AND CABINETS
 - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Crouse-Hinds, an Eaton business.
 - 2. Hubbell Incorporated.
 - 3. Wiremold / Legrand.
 - 4. Approved Equal.
 - B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets shall be listed and labeled for intended location and use.
 - C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, Type FD.
- E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- F. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. Comply with NECA 1.
 - B. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.2 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Category 5e twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cable management system.
 - 4. Grounding provisions for twisted pair cable.

1.2 COPPER HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cabling system shall provide interconnections between Backboard and the equipment outlet, otherwise known as "Cabling Subsystem 1," in the telecommunications cabling system structure. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
 - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
 - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft. and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Reviewed and stamped by Qualified Personnel.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Software and Firmware Operational Documentation:
 - 1. Device address list.
- 1.6 QUALITY ASSURANCE
 - A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
 - 2. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
 - B. Testing Agency Qualifications: Testing agency must have personnel certified by BICSI on staff.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

1.7 COORDINATION

A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.8 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, provide software support for two years.
- B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA-568-C.1, when tested according to test procedures of this standard.

- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed cable routing assembly.
 - 2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - 3. Communications, Non-plenum: Type CMR complying with UL 1666.
 - 4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
 - 5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. RoHS compliant.

2.3 CATEGORY 5e TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden Inc.
 - 2. CommScope, Inc.
 - 3. West Penn Wire.
 - 4. Approved Equal.
- C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.
- D. Conductors: 100-ohm, 24 AWG solid copper.
- E. Shielding/Screening: Shielded twisted pairs (FTP).

- F. Cable Rating: Riser.
- G. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. 3M.
 - 2. Belden CDT Networking Division/NORDX.
 - 3. Superior Essex Inc.
 - 4. Approved Equal.
- C. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 5e.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Source Limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- E. See discussion in the Evaluations about 110-style IDC connectors and connector blocks.
- F. Connecting Blocks:
 - 1. 110-style IDC for Category 5e.
 - 2. 66-style IDC for Category 5e.
 - 3. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- G. Jacks and Jack Assemblies:
 - 1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 - 2. Designed to snap-in to a patch panel or faceplate.
 - 3. Standard: Comply with TIA-568-C.2.
 - 4. Marked to indicate transmission performance.
- H. Faceplate:
 - 1. Four port, vertical single gang faceplates designed to mount to single gang wall boxes.
 - 2. Eight port, vertical double gang faceplates designed to mount to double gang wall boxes.

- 3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
- 4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
- I. Legend:
 - 1. Machine printed, in the field, using adhesive-tape label.

2.5 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-B.

PART 3 - EXECUTION

3.1 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. Wiring Method: Install cables in raceways and cable trays, except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring secured by J-Hooks or D-Rings may be used. Conceal raceway and cables, except in unfinished spaces.
- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.
- D. General Requirements for Cabling:
 - 1. Comply with TIA-568-C.1.
 - 2. Comply with BICSI's Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
 - 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 6. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

- 7. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
- 8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
- 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.
- Pulling Cable: Comply with BICSI Information Transport Systems Installation Methods Manual, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
 - 1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.

3.2 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BISCI's "Telecommunications Distribution Methods Manual."

3.3 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 25 feet (4.5 m).
 - 4. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.

- a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a buildingmounted device, with the name and number of a particular device.
- b. Label each unit and field within distribution racks and frames.
- 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- C. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections by qualified personnel.
- B. Tests and Inspections:
 - 1. Visually inspect jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

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SECTION 280000 - GENERAL PROVISIONS FOR ELECTRONIC SAFETY AND SECURITY

Reference Section 260000 - General Provisions for Electrical

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electronic safety and security installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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- 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings; product name or designation or comparable product by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
- 3. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- 4. Pressure Plates: Carbon steel. Include two for each sealing element.
- 5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

- A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.3 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire alarm wire and cable.
 - 2. Identification products.

1.2 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- E. RCDD: Registered Communications Distribution Designer.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Pathways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

- 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 PROJECT CONDITIONS

- A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
 - 1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.
- B. Environmental Limitations: Do not deliver or install fire alarm cabling and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of Category 5e cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 FIRE ALARM WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Comtran Corporation.
 - 2. Draka Cableteq USA.
 - 3. Genesis Cable Products; Honeywell International, Inc.
 - 4. Rockbestos-Suprenant Cable Corp.
 - 5. West Penn Wire; a brand of Belden Inc.

- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG and size as recommended by system manufacturer.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.3 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. HellermannTyton.
 - 3. Kroy LLC.
 - 4. PANDUIT CORP.
- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."etain first paragraph below to require an independent testing agency. Independent certification may be acceptable to authorities having jurisdiction without further monitoring of plant's quality-control and testing program by Owner.

2.4 INSTALLATION OF PATHWAYS

- A. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.
- C. Install manufactured conduit sweeps and long-radius elbows whenever possible.

2.5 WIRING METHOD

- A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
- B. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be supported by either J-Hooks or D-Rings. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
- C. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

2.6 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 7. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
 - 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
 - 9. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

- D. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
 - 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
 - 5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

2.7 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
- C. Wiring Method:
 - 1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
 - 2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.

- 3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.
- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

2.8 CONNECTIONS

A. Comply with requirements in Division 28 Section "Digital Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

2.9 FIRESTOPPING

- A. Comply with requirements in Division 07 Section "Penetration Firestopping."
- B. Comply with TIA-569-B, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

2.10 GROUNDING

- A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

2.11 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

2.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide or transfer the data from the instrument to the computer, save as text files, print, and submit.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. System smoke detectors.
 - 2. Heat detectors.
 - 3. Notification appliances.
- B. Related Requirements:
 - 1. Section 271513 "Communications Copper Horizontal Cabling" for cables and conductors for fire-alarm systems.

1.2 ACTION SUBMITTALS

- A. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - 2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified, fire-alarm technician; Level II minimum.
 - c. Licensed or certified by authorities having jurisdiction.
- B. Product Data: For each type of product, including furnished options and accessories.
- C. Shop Drawings: For fire-alarm system.
 - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - 2. Include plans, elevations, sections, details, and attachments to other work.
 - 3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
 - 4. Detail assembly and support requirements.
 - 5. Include voltage drop calculations for notification-appliance circuits.
 - 6. Include battery-size calculations.
 - 7. Include input/output matrix.
 - 8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.

- 9. Include performance parameters and installation details for each detector.
- 10. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
 - 2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
 - 3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Data: Certificates, for fire-alarm control unit, accessories, and components, from manufacturer.
- C. Field quality-control reports.
- D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment.
 - d. Record copy of site-specific software.
 - e. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

- 1) Equipment tested.
- 2) Frequency of testing of installed components.
- 3) Frequency of inspection of installed components.
- 4) Requirements and recommendations related to results of maintenance.
- 5) Manufacturer's user training manuals.
- f. Manufacturer's required maintenance related to system warranty requirements.
- g. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).
- D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

- B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.
- C. Automatic sensitivity control of certain smoke detectors.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Automatic sprinkler system water flow.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm and specific initiating device at fire-alarm control unit.
 - 3. Unlock electric door locks in designated egress paths.
 - 4. Release fire and smoke doors held open by magnetic door holders.
 - 5. Recall elevators to primary or alternate recall floors.
 - 6. Activate elevator power shunt trip.
 - 7. Activate emergency lighting control.
 - 8. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions: Retain only those devices and actions in subparagraphs below applicable to Project. Coordinate with requirements in other Sections that specify devices and systems.
 - 1. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Open circuits, shorts, and grounds in designated circuits.
 - 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 - 3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
 - 4. Loss of primary power at fire-alarm control unit.
 - 5. Ground or a single break in internal circuits of fire-alarm control unit.
 - 6. Abnormal ac voltage at fire-alarm control unit.
 - 7. Break in standby battery circuitry.
 - 8. Failure of battery charging.
 - 9. Abnormal position of any switch at fire-alarm control unit or annunciator.

- E. System Supervisory Signal Actions:
 - 1. Initiate notification appliances.
 - 2. Identify specific device initiating the event at fire-alarm control unit.
 - 3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SimplexGrinnell LP.
- B. General Requirements for Fire-Alarm Control Unit:
 - 1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
 - 2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
 - 3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
- C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 - 1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
 - 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
- D. Notification-Appliance Circuit:
 - 1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
 - 2. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- E. Elevator Recall:

- 1. Elevator recall shall be initiated only by one of the following alarm-initiating devices:
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detectors in elevator hoistway.
- 2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located on the designated recall floors are activated.
- 3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.
- F. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.
- G. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- H. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the powersupply module rating.
- I. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.5 MANUAL FIRE-ALARM BOXES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SimplexGrinnell LP.
- B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.
 - 1. Single-action mechanism, [breaking-glass or plastic-rod] [pull-lever] type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SimplexGrinnell LP.
- B. General Requirements for System Smoke Detectors:

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- 1. Comply with UL 268; operating at 24-V dc, nominal.
- 2. Detectors shall be two-wire type.
- 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- 4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
- 6. Integral Visual-Indicating Light: LED type, indicating detector has operated and poweron status.
- 7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition.
 - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
 - b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
- C. Photoelectric Smoke Detectors:
 - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- D. Ionization Smoke Detector:
 - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
- 4. Each sensor shall have multiple levels of detection sensitivity.
- 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SimplexGrinnell LP.
- B. General Requirements for Heat Detectors: Comply with UL 521.
 - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- C. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. SimplexGrinnell LP.

- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a singlemounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Chimes: Vibrating type.
- D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.
- E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
 - 1. Mounting: Wall mounted unless otherwise indicated.
 - 2. Flashing shall be in a temporal pattern, synchronized with other units.
 - 3. Strobe Leads: Factory connected to screw terminals.
 - 4. Mounting Faceplate: Factory finished, red.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Section 270548.16 "Seismic Controls for Communications Systems."
- D. Manual Fire-Alarm Boxes:
 - 1. Install manual fire-alarm box in the normal path of egress within 60 inchesof the exit doorway.
 - 2. Mount manual fire-alarm box on a background of a contrasting color.
 - 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.

- E. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.
- F. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

3.2 PATHWAYS

- A. Pathways above recessed ceilings and in non-accessible locations may be routed exposed and secured by D-Rings or J-Hooks.
 - 1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.
- C. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS

- A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Alarm-initiating connection to elevator recall system and components.
 - 2. Supervisory connections at elevator shunt-trip breaker.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 270553 "Identification for Communications Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Perform the following tests and inspections by qualified personnel:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

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- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 284621.11