
Project Book

Dawson County

**Adult Probation Office /
Juvenile Probation Office
Renovation**

**411 South First Street
Lamesa, Texas 79331**

CHA, Inc. Project Number 2401

May 31, 2024



www.chapmanharvey.com 806.749.1153
612 Broadway Lubbock, Texas 79401
806-749-1153 fax 749-1866

Set No. _____

Dawson County
 APO-JPO Renovation
 411 South First Street
 Lamesa, Tx 79331

May 31, 2024

Chapman Harvey Architects, Inc.
 CHA, Inc. Project 2401



Table of Contents

Bidding Requirements and Conditions of the Contract

	REVISED PER	
Notice to Bidders	ADDENDUM 2	00 003
Instructions to Bidders		00 100
Bid Form		00 300
Tax Exemption Certificate		00 400
General Conditions		00 600
Supplementary Conditions		00 610
Payment Bond		012
Performance Bond		013

Division 1 General Requirements

01 11 13	Summary of Work
01 31 00	Coordination and Meetings
01 33 00	Submittals
01 43 00	Quality Control
01 50 00	Construction Facilities
01 60 00	Material and Equipment
01 70 00	Contract Closeout

Division 2 Site Work

02 41 13	Selective Demolition
----------	----------------------

Division 6 Wood and Plastic

06 10 00	Rough Carpentry
06 16 00	Sheathing
06 41 16	Architectural Millwork

Division 7 Thermal and Moisture Protection

07 21 16	Batt and Blanket Insulation
07 46 16	Aluminum Siding
07 54 23	TPO Roofing Membrane
07 62 00	Sheet Metal Flashing and Trim
07 92 00	Joint Sealers

<u>Division 8</u>	<u>Doors and Windows</u>
08 11 13	Hollow Metal Frames
08 11 16	Aluminum Entrances and Storefronts
08 13 13	Steel Doors
08 14 29	Prefinished Wood Doors
08 71 00	Finish Hardware
08 80 00	Glazing
08 88 10	Bullet Resistant Aluminum Windows

<u>Division 9</u>	<u>Finishes</u>
09 29 00	Gypsum Board Systems
09 30 13	Ceramic Tile
09 51 00	Suspended Acoustical Ceiling System
09 65 13	Resilient Base
09 65 19	Resilient Tile Flooring
09 68 13	Modular Carpet Tile
09 90 00	Painting

<u>Division 10</u>	<u>Specialties</u>
10 11 16	Markerboards and Tackboards
10 14 23	Interior Signage
10 26 40	Bullet Resistant Fiberglass Panels
10 28 00	Toilet Accessories
10 42 19	Dimensional Letter Signs
10 44 43	Fire Extinguishers and Cabinets

<u>Division 12</u>	<u>Furnishings</u>
12 24 10	Roller Shades

<u>Division 15</u>	<u>Mechanical</u>
See Mechanical TOC	

<u>Division 16</u>	<u>Electrical</u>
See Electrical TOC	

**NOTICE TO BIDDERS
REQUEST FOR SEALED BIDS
DAWSON COUNTY
APO/JPO BUILDING REMODEL**

Dawson County is requesting sealed bids for the remodel of the new Adult and Juvenile Probation Department Building located at 411 South First Street, Lamesa, Texas 79331. Bid packets can be picked up at the Dawson County Auditor's Office located at 502 N. 1st Street, Suite B, Lamesa, Tx 79331. For specific information and specification questions, contact County Judge Foy O'Brien at (806) 759-4430. Sealed bids will be accepted until 4:30 PM on September 13, 2024 at 502 N. 1st St., Suite B, Lamesa, Tx 79331. Attn: Esmeralda Felan or may be mailed to Dawson County Auditor, PO Box 1268, Lamesa, Tx 79331. **Please mark the outside of the envelope "APO/JPO Reno."** The sealed bid will be awarded on September 17, 2024 at 4:00 PM. The County of Dawson reserves the right to negotiate with any and all individuals or firms that submit bids, as per the Texas Professional Services Procurement Act and the Uniform Grant and Contract Management Standards. Disadvantaged Business Enterprises including Minority Business Enterprises, Small Business Enterprises, Women Business Enterprises, and Labor Surplus Vendors are encouraged to submit proposals. The County of Dawson is an Affirmative Action/Equal Opportunity Employer.

Plans, Project Manuals, and related documents may be examined and acquired by download from [Dawson County, Texas](#) or from [PROJECT STATUS | chapmanharveyarch](#) Please contact Larissa@chapmanharvey.com to be added to the bidders list to receive addenda notifications. All questions regarding the drawings and specifications shall be made in writing no later than 3 days prior to bid to lenora@chapmanharvey.com.

A PRE-BID MEETING WILL BE HELD TUESDAY, AUGUST 20 AT 2:00 PM AT THE PROJECT SITE. Attendance is not mandatory, but all bidders are encouraged to attend.

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ARTICLE 1 DEFINITIONS

- 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.
- 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.
- 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.
- 1.4 The term Architect shall include the Engineer, Architect and their appointed representatives.
- 1.5 A Bid is a complete and properly signed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- 1.6 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents. No unit pricing is required on this project.
- 1.8 A Bidder is a person or entity who submits a Bid.
- 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

- 2.1 The Bidder, by making a Bid, represents that:
 - 2.1.1 The Bidder has read and understands the Bidding Documents and the Bid is made in accordance therewith.
 - 2.1.2 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.
 - 2.1.3 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

- 3.1 COPIES
 - 3.1.1 Bidders may obtain complete sets of the Bidding Documents as defined in the Invitation to Bid in the number and for the deposit sum stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.
 - 3.1.2 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
 - 3.1.3 In making copies of the Bidding Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.
- 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.
- 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in another manner will not be binding, and Bidders shall not rely upon them.

3.3 SUBSTITUTIONS

- 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.
- 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other material, equipment or other portions of the Work including changes in the work of other contracts that incorporation of the proposed substitution would require shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect decision of approval or disapproval of a proposed substitution shall be final.
- 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.
- 3.3.4 Substitutions will be considered after the Contract only as defined in Section 01600 -MATERIAL AND EQUIPMENT.
- 3.3.5 Owner's advantage to select substitution submitted by contractor based on either cost and/or quality.

3.4 TIME OF COMPLETION

- 3.4.1 The contractor shall state in his proposal, the number of calendar days required to complete the work. The date stated will be one of the items for consideration of award of contract. This date, if accepted by the owner, shall become the completion date for the contract.

3.5 LIQUIDATED DAMAGES

- 3.5.1 No liquidated damages

3.6 COMMENCING OF WORK

- 3.6.1 Shortly after the contract is awarded and contracts signed, there will be a pre-construction conference with the Architect, Owner, Contractor and Sub-Contractors to discuss in general the construction of the project.
- 3.6.2 The work of this contract shall follow the following dates and events unless changed by addendum before project bids or by change order after project is awarded.

3.7 RECORD OF DRAWINGS

- 3.7.1 The contractor shall maintain one copy of all drawings and specifications in good order and marked to record all changes during construction. This "as built" set of drawings and specifications shall be given to the architect at the end of the project and before final payment.

3.8 DATE OF SUBSTANTIAL COMPLETION OF WORK

- 3.8.1 See Article 9.8 of the A.I.A. Document A201, 1987. A Certificate of Substantial Completion, A.I.A. Document G704, will be used and after written acceptance by the Architect, Contractor, and Owner, it will establish the date of substantial completion. No liquidated damages will be assessed after this date.

3.9 ADDENDA

- 3.9.1 Addenda will be emailed or delivered to all who are known by the issuing office to have received a complete set of Bidding Documents.
- 3.9.2 Copies of Addenda will be made available electronically for inspection wherever Bidding Documents are on file for that purpose.
- 3.9.3 No Addenda will be issued later than three days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.
- 3.9.4 Each Bidder shall ascertain, prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

4.1 FORM AND STYLE OF BIDS

- 4.1.1 Bids shall be submitted on the bid form included with the Bidding Documents.
- 4.1.2 All blanks on the bid form shall be filled in by typewriter or manually, in ink.
- 4.1.3 Interlineation, alterations and erasures must be initialed by the signer of the Bid.
- 4.1.4 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.
- 4.1.5 A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

4.2 BID SECURITY

- 4.2.1. A bid bond or cashier's check payable to the owner in the amount not less than (5%) of the largest possible total for the proposal submitted, must accompany each proposal. MONEY ORDERS OR CASH ARE NOT ACCEPTABLE SECURITY.
- 4.2.2. Proposal security received by the district will be returned within ten (10) days for all responses rejected by the District. Proposal security for a vendor's response under consideration by the district will be returned within ninety (90) days following the receiving deadline if the vendor's response is not accepted by the District.
- 4.2.3. If a vendor's response is accepted by the District and a contract is offered pursuant to the terms of the invitation, but the vendor does not execute a contract within ten (10) days from the date of offer of a contract, the District may declare such vendor's proposal security forfeited to the District.

4.3 SUBMISSION OF BIDS

- 4.3.1 All copies of the Bid, the bid security, and other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed as indicated in the Invitation to

Bidders and shall be identified with the Project name, the Bidder's name and address and the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

- 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.
- 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
- 4.3.4 Oral, telephonic, telegraphic, facsimile or electronic email Bids are invalid and will not receive consideration.

4.4 MODIFICATION OR WITHDRAWAL OF BID

- 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder after Bid date and time.
- 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram; if by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.
- 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

ARTICLE 5 CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

- 5.1.1 As stated in the Invitation to Bid, the properly identified Bids received on time will be opened and evaluated privately.

5.2 REJECTION OF BIDS

- 5.2.1 The owner shall have the right to reject any, or all Bids, reject a Bid not accompanied by a required bid security, or by other data required by the Bidding Documents, or reject a Bid which is in any way incomplete or irregular.

5.3 ACCEPTANCE OF BID (AWARD)

- 5.3.1 The Owner shall have the right to waive informalities or irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

ARTICLE 6 PERFORMANCE BOND AND PAYMENT BOND

6.1 BOND REQUIREMENTS

- 6.1.1 In the event the contract amount exceeds \$25,000.00, the contractor to whom the contract is awarded must provide a payment bond in the amount of 100% of the contract price.
- 6.1.2 In the event the contract amount exceeds \$100,000.00, the contractor to whom the contract is awarded must provide a performance bond in the amount of 100% of the contract price.

ARTICLE 7 CRIMINAL BACKGROUNDS

- 7.1 All contractors, subcontractors, and their employees must submit to the District proof of a satisfactory criminal record history of all individuals working on District property through back-ground checks conducted as required by Senate Bill 9. The criminal record history must be obtained by the successful vendor before any work is

performed. The information regarding the requirements for conducting a criminal records check is posted on the Texas Department of Public Safety's website, www.txdps.state.tx.us by clicking open Crime Records and reading School District Guide to Senate Bill 9.

7.2 Respondent agrees by signing and executing this solicitation to provide assurance that all employees, subcontractors, and volunteers of the provider who have contact with students have passed a criminal history background check current within the last year as per defined in Senate Bill 9.

ARTICLE 8 PREVAILING WAGE RATES

8.1 Bidders are required to comply with Texas Government Code, Chapter 2258 Prevailing Wage Rates, with respect to payment of prevailing wage rates for the construction or improvements, paid for in whole or in part from public funds, without regard to whether the work is done under public supervision or direction. A worker is employed on a public work if the worker is employed by the contractor or any subcontractor in the execution of the contract for the project.

8.2 A worker employed on a public work by or on behalf of the Hereford Independent School District shall be paid no less than the general prevailing rate of per diem wages for the work of a similar character in the locality in which the work is performed, and not less than the general prevailing rate of per diem wages for legal holiday and overtime work. Wage rates can be found <https://sam.gov/content/wage-determinations> as included below.

The Contractor or subcontractor who violates Texas Government Code Section 2258.023 shall forfeit as a penalty to Hereford Independent School District, \$60.00 for each worker employed for each calendar day, or portion thereof, such worker is paid less than the stipulated rates for any work done under this contract by him, or by any subcontractor under him.

Nothing herein contained, however, shall be construed to prohibit the payment of more than the prevailing rate of wages to any worker employed on the work.

Davis-Bacon Act WD #: [TX20240194](#)

State

Texas

Counties

Borden, Crane, Dawson

DBA Wage Determination

Modification Number

2

Construction Types

Building

Published Date

Aug 8, 2024

"General Decision Number: TX20240194 08/09/2024

Superseded General Decision Number: TX20230194

State: Texas

Construction Type: Building

Counties: Borden, Crane and Dawson Counties in Texas.

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

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are

subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

<p>If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p> <p>the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.</p>	<p>. Executive Order 14026 generally applies to the contract.</p> <p>The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.</p>
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<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p> <p>\$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.</p>	<p>. Executive Order 13658 generally applies to the contract.</p> <p>The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.</p>
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The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

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

Modification Number	Publication Date
0	01/05/2024
1	07/12/2024
2	08/09/2024

ASBE0021-001 06/01/2023

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 31.32	7.52

* BOIL0592-002 01/01/2023

Rates	Fringes
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Boilermaker.....\$ 37.00 24.64

IRON0263-019 06/01/2023

Rates Fringes

Ironworker, reinforcing and
structural.....\$ 27.89 7.93

LABO0154-010 05/01/2024

Rates Fringes

Laborers: (Mason Tender -
Cement/Concrete).....\$ 25.27 9.57

PLUM0404-001 09/01/2022

Rates Fringes

PLUMBER.....\$ 28.64 10.65

* SUTX2009-081 04/20/2009

Rates Fringes

ACOUSTICAL CEILING MECHANIC.....\$ 14.50 ** 0.00

BRICKLAYER.....\$ 17.76 0.00

CARPENTER, Includes Drywall
Hanging (Excludes Acoustical
Ceiling Installation).....\$ 13.46 ** 0.00

CEMENT MASON/CONCRETE FINISHER...\$ 13.27 ** 0.00

ELECTRICIAN.....\$ 15.85 ** 0.00

LABORER: Common or General.....\$ 8.72 ** 0.00

LABORER: Landscape &
Irrigation.....\$ 8.50 ** 0.22

LABORER: Mason Tender - Brick...\$ 12.02 ** 0.00

LABORER: Mortar Mixer.....\$ 9.50 ** 0.00

LATHER.....\$ 12.00 ** 0.00

OPERATOR:
Backhoe/Excavator/Trackhoe.....\$ 13.75 ** 0.00

OPERATOR: Bulldozer.....\$ 12.80 ** 0.43

OPERATOR: Crane.....\$ 21.33 0.00

OPERATOR: Forklift.....\$ 14.58 ** 0.00

OPERATOR: Loader (Front End)....	\$ 10.54 **	0.00
PAINTER: Brush, Roller and Spray.....		
	\$ 15.80 **	0.00
PLASTERER.....	\$ 12.00 **	0.00
ROOFER.....	\$ 15.10 **	1.29
SHEET METAL WORKER, Includes HVAC Duct Installation.....		
	\$ 18.00	0.00
TILE SETTER.....	\$ 15.00 **	0.00
TRUCK DRIVER.....	\$ 11.24 **	0.35

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

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union

average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

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

State Adopted Rate Identifiers

Classifications listed under the ""SA"" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator

(See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

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

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

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

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

END OF GENERAL DECISION"

END OF DOCUMENT

BID FORM

Date:

OWNER'S NAME: DAWSON COUNTY

OWNER'S ADDRESS: 411 South First Street
Lamesa, Texas 79331

BID SUBMITTED BY: _____

SCOPE OF BID: _____

The undersigned, having carefully examined the specifications, drawings, and related documents entitled:

**Dawson County,
Adult Probation Office/Juvenile Probation Office Renovation**

all as prepared by Chapman Harvey Architects Inc., 612 Broadway, Lubbock, Texas, made an on-site inspection of the premises and all other conditions affecting the cost and/or execution of the work, proposes to furnish all materials, labor, and equipment necessary to complete the work in accordance with said documents, of which this bid is a part, for the following sum, including any designated contingency allowances:

BASE BID _____

_____ Dollars (\$ _____)

(Note: All amounts shall be shown in both written and figure form. In case of discrepancy between the written amount and the figure, the written amount will govern. For alternate bid items, circle one of the options: add, deduct, or no change. If not circled, will assume no change.)

The undersigned acknowledges receipt of _____ addenda to the Drawings and Specifications as follows:

No. _____ Date _____ No. _____ Date _____ No. _____ Date _____

No. _____ Date _____ No. _____ Date _____ No. _____ Date _____

(The Bidder is to fill in I.D. Number and date of each thereby acknowledging receipt of addenda).

If awarded the contract, the undersigned agrees to commence work under this contract on or before a date to be specified in a Written Notice to Proceed and to substantially complete the project within the calendar days stipulated below from said date, unless modified by change order.

Project Base Bid: _____ calendar days.

If notified of the acceptance of this proposal within thirty (30) days of the time set for the opening of bids, bidder agrees within ten (10) days of notification, to execute a contract in the form of the AIA Document A101, Standard Form of Agreement Between Owner and Contractor as amended for the above work, for the above stated compensation.

BID SECURITY, as defined in the Invitation and Instructions to Bidders, which the Undersigned agrees to

disposition of, as stated in Invitation and Instructions to Bidders, is attached to this Bid.

It is understood that the Owner reserves the right to accept or reject any and all Bids and to waive all formalities in accordance with State law.

Respectfully Submitted,

By: _____

Title: _____

Business Address:

(SEAL: If Bid is by Corporation)

Telephone Number: (____) _____

FAX Number: (____) _____

E-mail Address: _____

Fill in the applicable information:

A Corporation, chartered in the State of _____. Authorized to do business in the State of Texas.

A Partnership, composed of _____, and
_____ and _____.

An Individual operating under the name of _____
_____.

END BID FORM

Dawson County
APO-JPO Renovation
411 South First Street
Lamesa, Tx 79331

197/89

Tax Exemption Certificate

The undersigned hereby claims an exemption from payment of taxes under Chapter 20, Title 122A, revised Civil Statutes of Texas, for the purchase of the tangible personal property described below or on attached order or invoice, which is made a part hereof, and will be purchased from:

The reason that said purchaser is claiming this exemption is: Exempt under Article 12.03, Title 122A, Taxation General, B.S.C. of Texas.

The purchaser will be liable for payment of the limited Sales and Use Tax if the purchaser uses the tangible personal property in some other manner or for some other use other than reason listed above, and shall pay the tax based on the price for the tangible personal property.

Description of tangible personal property to be purchased:

Executed this the _____ day of _____, 20_____.

Purchaser

Agency Purchased For

Address

PART 1 GENERAL

1.01 APPLICABLE DOCUMENT

- A. AIA Document A201.2017 "General Conditions of the Contract for Construction" is a part of this Project Manual to the same extent as if bound herein. Copies may be obtained from the Architect upon request.

PART 2 PRODUCTS

Not used

PART 3 PRODUCTS

Not used

END OF SECTION

GENERAL:

Supplements: The following supplements modify, change, delete from or add to the "General Conditions of the Contract for Construction", A.I.A. Document A201, Fourteenth Edition, 2007. Where any article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph or Clause shall remain in effect.

ARTICLE 1: GENERAL PROVISIONS

1.2 Execution, Correlation and Intent: Add the following Subparagraphs:

1.2.6 The mention of certain items in the Specifications to the exclusion of others (whether in the general statement of the work in a section or paragraph or in itemized lists of any nature); or the mention of work to be done in a specific area to the exclusion of similar or like work required in other areas; or the failure to properly cross-reference related work specified elsewhere, shall not relieve the Contractor of his responsibilities under the Contract Documents.

1.2.7 The titles of sections and paragraphs are not necessarily fully descriptive of the work required thereby. The segregation of the various parts of the Work under headings, by trades, does not relieve the Contractor of the responsibility for furnishing every item shown on the drawings or specified in the specifications, or reasonably inferable therefrom as being necessary to produce the intended results, whether properly segregated or not.

1.2.8 If an item is addressed differently in two places of the contract documents the greater quality or quantity applies and is assumed to take precedence.

ARTICLE 3: CONTRACTOR

3.6 Taxes: Revise subparagraph 3.6.1 to read as follows:

The Contractor shall pay all taxes for the work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.

ARTICLE 4: ADMINISTRATION OF THE CONTRACT

4.2 Architect's Administration of the Contract: Add the following Clause:

4.2.14 Where "as directed," "as directed by Engineer," "as directed by Architect," or similar notation appears in the Contract Documents, the Contractor shall ask for and receive the necessary instructions from the Architect before proceeding with that portion of the Work. Requests for instructions shall be made in ample time to avoid delays in the Work.

4.3.6 Concealed Conditions: Add the following Clauses 4.3.6.1 and 4.3.6.2:

4.3.6.1 The concealed conditions encountered below the surface of the ground mentioned in 4.3.6 shall apply to man-made conditions only. The materials to be excavated shall be considered as unclassified and the Contractor shall assume responsibility for excavating to the depths and limits required by the Contract Documents unless otherwise directed by the Architect, in which case the unit prices stated in the Contract Documents or subsequently agreed upon shall apply.

4.3.6.2 Failure of the drawings to show underground utility lines or other concealed piping, wiring and the like shall not be construed as a guarantee on the part of the Architect or the Owner that such conditions do not exist, though unknown. All operations involving excavation or removals shall be done at the risk of the Contractor who shall take the necessary precautions to protect employees and the public from injury or death and to avoid damage to existing systems.

ARTICLE 5: SUBCONTRACTORS

5.2 Award of Subcontracts and other Contracts for Portions of the Work: Revise as follows:

5.2.2.1 (New Clause) - If required by the Architect, the Contractor shall submit evidence that the person or entity he proposes to use are competent, have had experience and have performed satisfactorily on jobs of similar size, complexity, type and scope. The information, if required, shall give complete experience records of the proposed person or entity which shall include:

Name of Job Architect	Type of Job Date Completed	General Contractor Approximate Cost (of subcontract)
--------------------------	-------------------------------	--

5.2.2.2 (New Clause) - The acceptance of a person or entity (including those who are to furnish materials or equipment fabricated to a special design) shall not constitute approval of the materials they customarily handle, unless the materials are acceptable to the Architect as being equal to those specified in quality, function, performance and appearance. The Architect shall be the sole judge as to acceptability of the materials as to appearance.

ARTICLE 9: PAYMENTS AND COMPLETION

9.3 Applications for Payment: Change as follows:

9.3.1 Add the following Clause 9.3.1.3:

9.3.1.3 Until Substantial Completion, the Owner will pay ninety-five percent of the amount due the Contractor on account of progress payments.

9.3.2 Add the following Clauses:

9.3.2.1 In preparing the Application for Payment, the Contractor shall verify the accuracy of the requests for payment submitted by his Subcontractors and materials suppliers and shall not include in his Application for Payment any sum which, in his opinion, if approved will result in an overpayment for their work performed or materials delivered.

9.3.2.2 All items which are shipped in crates or otherwise wrapped shall be uncrated or unwrapped and inspected by the Contractor upon arrival at the site. Materials shall be carefully inspected for quantities, sizes, color if color selection is a consideration, damage, or defects; and if damaged, defective, or otherwise not in conformance with the Contract Documents, shall be recorded immediately.

9.3.2.3 The contractor shall not request payment for any items until he has inspected the items and any materials which are not in conformance with the contract documents shall not be included in any Application for Payment.

9.11.2 The date of substantial completion of the work is identified in the proposal.

ARTICLE 11: INSURANCE AND BONDS

11.1 Contractor's Liability Insurance: Add the following Clauses 11.1.1.8, 11.1.1.9 and 11.1.2.1:

11.1.1.8 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises Operations (including X, C and U coverages as applicable).
2. Independent Contractors' Protective.
3. Products and Completed Operations.
4. Personal Injury Liability with Employment Exclusion deleted.
5. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
6. Owned, non-owned and hired motor vehicles.
7. Broad Form Property Damage including Completed Operations.

11.1.1.9 If the General Liability coverages are provided by a Commercial General Liability Policy on an occurrence basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting

period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Workers' Compensation:
 - (a) State Statutory Limits
2. General Liability: May be a single comprehensive form or a combination of comprehensive General Liability form and an umbrella with coverages including:
 - (a) Premises-operations
 - (b) Products/completed operations hazard
 - (c) Contractual Insurance
 - (d) Broad Form Property Damage
 - (e) Independent Contractors
 - (f) Personal Injury:
- 2.1 Limits of Liability shall not be less than the following:
 - (a) Per Occurrence \$1,000,000.00
3. Automobile Liability: Comprehensive form with coverage including: Owned, Non-owned and Hired vehicles:
- 3.1 Limits of Liability shall be not less than the following:
 - (a) Bodily Injury: \$100,000.00 (Each Person)
 - (b) Bodily Injury: \$300,000.00 (Each Occurrence)
 - (c) Property Damage: \$100,000.00 (Each Occurrence)
4. Builders Risk Insurance:

The Contractor shall, during the progress of the work, maintain insurance equal to the full amount of the cost of the project plus three per cent for additional costs. Policy shall be Inland Marine form, subject to the approval of the Owner as to form. The insurance shall cover all work incorporated in the building project and all materials for the same in or about the premises. Money received under any such insurance shall be paid in the same manner as monthly progress payments in relation to the costs incurred in the rebuilding or reparation of the work destroyed or damaged. Builders Risk Insurance shall be subject to a deductible of \$1,000.00 for all losses occasioned by perils insured. All other losses will be at the risk of the contractor(s).
5. Owner's Liability Insurance:

The Contractor shall obtain at his expense an Owner's Protective Liability Insurance Policy naming the Owner, its employees and the Architect as insured, with the following limits:

 - (a) \$1,000,000.00 Aggregate
 - (b) \$500,000.00 Each Occurrence
6. Certificates of Insurance for the above coverages shall be filed with the Owner before work is started.

11.3 Property Insurance:

11.3.1 Modify the first sentence of Subparagraph 11.3.1 as follows: Delete "unless otherwise provided, the Owner" and substitute "The Contractor."

Add the following sentences:

The form of policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributable thereto.

11.3.1.2 Delete Clause 11.3.1.2.

11.3.1.3 Delete Clause 11.3.1.3.

11.3.6 Delete Subparagraph 11.3.6 and substitute the following:

11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner two certified copies of the policy or policies providing his Property Insurance coverage, each containing those endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Contractor.

11.3.7 Modify Subparagraph 11.3.8 by substituting "Contractor" for "Owner" at the end of the first sentence.

11.3.8 Modify Subparagraph 11.3.9 by substituting "Contractor" for "Owner" as fiduciary; except that at the first reference to "Owner" in the first sentence, the work "this" should be substituted for "Owner's."

11.3.9 Modify Subparagraph 11.3.10 by substituting "Contractor" for "Owner" each time the latter work appears.

11.3.10 Modify Subparagraph 11.3.11 by substituting "Contractor" for "Owner" each time the latter word appears.

11.5 Add the following paragraph 11.5 to Article 11:

11.5 WORKMEN'S COMPENSATION INSURANCE

11.5.1 Required workers' compensation coverages, 28 TAC 110.110(c)(7), adopted to implement Texas Labor Code 406.096.

11.5.1.1 Workers' Compensation - Statutory Limits

11.5.2 A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (TWCC-81, TWCC-82, TWCC-83, or TWCC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project is required for the duration of the project.

11.5.2.1 Duration of the project includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

11.5.2.2 Persons providing services on the project ("subcontractor" in Texas Labor Code 406.096) include all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity that furnishes persons to provide services on the project.

11.5.2.3 Services include, without limitation, providing, hauling or delivering equipment or materials, or providing labor, transportation, or other service related to a project. Services do not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

11.5.4 If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

11.5.5 The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

- .1 A certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and
- .2 No later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

11.5.6 The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

11.5.7 The contractor shall notify the governmental entity in writing by certified mail or personal delivery, within ten days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

11.5.8 The contractor shall post on each project site a notice, in the text, form, and manner prescribed by the Texas Workers' Compensation Commission, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

11.5.9 The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

- .1 Provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code 401.011(44) for all of its employees providing services on the project for the duration of the project;
- .2 Provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project for the duration of the project;
- .3 Provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.
- .4 Obtain from each other person with whom it contracts, and provide to the contractor:
 - .a A certificate of coverage, prior to the other person beginning work on the project; and
 - .b A new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;
- .5 Retain all required certificates of coverage on file for the duration of the project and for one year thereafter;
- .6 Notify the governmental entity in writing by certified mail or personal delivery, within ten days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and
- .7 Contractually require each person with whom it contracts to perform as required by items 1-7, with the certificates of coverage to be provided to the person for whom they are providing services.

11.5.10 By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

11.5.11 The contractor's failure to comply with any of these provisions is a breach of contract by the contractor that entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

END OF SECTION

STATUTORY PAYMENT BOND PURSUANT TO TITLE 10, SUBTITLE F, CHAPTER 2253, SUBCHAPTER A.
OF THE GOVERNMENT CODE OF TEXAS:

KNOWN ALL MEN BY THESE PRESENTS, that _____

(Hereinafter called the Principal(s), as Principal(s)), and _____

(Hereinafter called the Surety(s), as Surety(s)), are held and firmly bound unto the Owner,
_____, (Hereinafter called the Obligee), in the amount of
_____ Dollars (\$ _____) lawful money of the United
States for the Payment whereof, the said Principal and Surety bond themselves, and their heirs, administrators,
executors, successors and assignees, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the ____ day of
_____, 20 __, to _____

and said Principal under the law is required before commencing the work provided for in said contract to execute a
bond in the amount of said contract which contract is hereby referred to and made a part hereof as fully and to the same
extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall
faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation
shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provision of Texas Government Code
Title 10, Subtitle F, Chapter 2253 Subchapter A and all liabilities on this bond shall be determined in accordance with
the provisions of said article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal(s) and Surety(s) have signed and sealed this instrument this ____ day of
_____, 20 __.

Surety

Principal

*By: _____
(Title)

By: _____
(Title)

By: _____
(Title)

By: _____
(Title)

The undersigned surety company represents that it is duly qualified to do business in Texas, and hereby designates

_____ an agent resident in _____ County to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship.

Surety
By: _____
(Title)

Approved as to Form:
Notary Seal

By: _____
Notary

*Note: If signed by an officer of the Surety Company there must be on file a certified extract from the by-laws showing that this person has authority to sign such obligation. If signed by an Attorney in Fact, we must have copy of power of attorney for our files.

STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 10, SUBTITLE F, CHAPTER 2253,
SUBCHAPTER A. OF THE GOVERNMENT CODE OF TEXAS:

KNOWN ALL MEN BY THESE PRESENTS, that _____

(Hereinafter called the Principal(s), as Principal(s)), and _____

(Hereinafter called the Surety(s), as Surety(s)), are held and firmly bound unto the Owner, _____, (Hereinafter called the Obligee), in the amount of _____ Dollars (\$ _____) lawful money of the United States for the Payment whereof, the said Principal and Surety bond themselves, and their heirs, administrators, executors, successors and assignees, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the ____ day of _____, 20 __, to _____

and said Principal under the law is required before commencing the work provided for in said contract to execute a bond in the amount of said contract which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provision of Texas Government Code Title 10, Subtitle F, Chapter 2253 Subchapter A and all liabilities on this bond shall be determined in accordance with the provisions of said article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal(s) and Surety(s) have signed and sealed this instrument this ____ day of _____, 20 __.

Surety

Principal

*By: _____

By: _____

(Title)

(Title)

By: _____

(Title)

By: _____

(Title)

The undersigned surety company represents that it is duly qualified to do business in Texas, and hereby designates

_____ an agent resident in _____ County to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship.

Surety

By: _____

(Title)

Approved as to Form:

Notary Seal

By: _____

Notary

*Note: If signed by an officer of the Surety Company there must be on file a certified extract from the by-laws showing that this person has authority to sign such obligation. If signed by an Attorney in Fact, we must have copy of power of attorney for our files.

SECTION 01 11 13
SUMMARY OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Work covered by Contract Documents.
- B. Coordination of hazardous material.
- C. Owner's responsibilities.
- D. Contractor's use of site and premises.
- E. Contingency allowances.
- F. Project completion time.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Work of this project includes all items shown and/or described in the bid documents for Renovations to existing building at address shown of approximately 6500 sf. Work to include interior finish out of two department offices separated by acoustically rated walls and includes security features at lobby including bullet resistant assemblies, new lighting, millwork, ceilings and finishes as shown on the drawings.
- B. All installed work shall be in compliance with the Americans with Disabilities Act and Texas Accessibility Standards
- C. Scope of work includes required limited interior demolition and disposal.

1.4 OWNER'S RESPONSIBILITIES

- A. Assist the contractor in maintaining job site safety by instructing employees, and visitors of the potential dangers at the site.
- B. Provide access for the contractor to portions of the existing site as may be required for this project.
- C. Provide parking and storage space for contractor's employees, equipment, and materials. These items to be coordinated with owner prior to start of construction.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Staging will be required to be interior or coordinated with owner for offsite staging location. Damage to lots used to be repaired by contractor.

1.6 OWNER OCCUPANCY

- A. The owner will not occupy the site and existing buildings on the site during the period of construction.

1.7 CONTINGENCY ALLOWANCES

- A. \$65,000 Owner Contingency

1.8 PROJECT COMPLETION TIME

- A. Project completion time to be determined by contractor as a part of their bid for work on the addition.
- B. See Article 8.1.4 of the General Conditions for definition of Working Days.
- C. See Article 8.1.1 of the General Conditions for computation of Contract Time.
- D. See Article 8.3 of the General Conditions for claims for extension of Contract Time.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 31 00

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Coordination.
- B. Renovation project procedures.
- C. Existing conditions.
- D. Pre-Construction conference.

1.3 COORDINATION

- A. Contractor shall coordinate scheduling, submittals, and work of the various sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. A project schedule shall be prepared and updated monthly by the general contractor. Provide copies of the updated project schedule at the beginning of each month
- C. Contractor to schedule a pre-demolition job site meeting with the architect and Owner prior to starting this work. Regularly schedule update meetings at agreed upon intervals, either weekly or bi-weekly.
- D. The contractor shall schedule and coordinate the work so that once Notice to proceed is issued, work will proceed on a steady, continuous course without delay.
- E. Contractor shall coordinate completion and clean up of work in preparation for substantial completion.
- F. The Contractor may use portions of the site for staging material. Be mindful to not interfere with the needs of neighboring properties.

1.4 EXISTING CONDITIONS

- A. Underground utilities: Failure of the drawings to show concealed utility lines or other concealed piping, wiring and the like shall not be constructed as a guarantee on the part of the architect or the owner that such conditions do not exist, though unknown. All operations involving excavation or removals shall be done at the risk of the contractor who shall take the necessary precautions to protect employees and the public from injury or death and to avoid damage to existing systems.
- B. Damage to existing systems: Whether exposed or concealed, any piping (such as piping for gas, water, waste, vent, drainage, sewer, heating, or cooling systems, etc.) or wiring (such as wiring for electric lighting, power, public address, telephone, or signaling systems, etc.) which is encountered during the construction period and becomes damaged shall be repaired or replaced at

contractor's expense. Only life and property threatening conditions may be repaired prior to a fully executed field order.

1.5 PRE-CONSTRUCTION CONFERENCE

- A. Attendance: After award of contract and prior to start of construction, contractor's direct representative, major subcontractors, owner's employees responsible for project, architects and engineers shall attend conference. Time and location as mutually agreed.
- B. Agenda:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Distribution of Contract Documents.
 - 3. Submission of list of subcontractors, list of products, Schedule of Values, and progress schedule.
 - 4. Designation of personnel representing the parties in contract.
 - 5. Procedures and processing RFI, ASI, field decisions, material submittals, product substitutions, monthly applications for payment, CCR, Change Orders, amendments to the contract and Contract closeout procedures.
 - 6. Coordinated daily use of premises by owner and contractor.
 - 7. Owner's requirements.
 - 8. Security and housekeeping procedures, identification of contractor's work force.
 - 9. Project Schedules.
 - 10. Procedures for maintaining record documents at the site.
 - 11. Review of Texas Accessibility Standards.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.
- B. Submit copies of all City Permits and inspection receipts to architect.

1.2 SECTION INCLUDES

- A. Submittal procedures.
- B. Schedule of Values.
- C. Construction Progress Schedules.
- D. Application for Payment.
- E. Shop drawings.
- F. Samples.
- G. Change Procedures.
- H. Manufacturer's instructions.
- I. Manufacturer's certificates.
- J. AIA Form G702 - Application and Certificate for Payment.
- K. AIA Form G703 - Continuation Sheet.

1.3 RELATED SECTIONS

- A. Section 01700 - Contract Closeout: Contract warranty and closeout submittals.

1.4 SUBMITTAL PROCEDURES

- A. If agreeable to all parties involved, all submittals are to be in electronic format, with the exception of: color charts, product samples, and finished texture samples.
- B. Transmit each submittal with AIA Form G810 or contractor's standard preprinted transmittal form. Identify the project title, project number, the number of copies submitted, give notice of any deviation from contract documents and any other pertinent data.
- C. Sequentially number the transmittal forms. Do not repeat a transmittal number, keep each unique.
- D. Identify project, contractor, subcontractors or supplier; pertinent drawing sheet and detail number(s), and specification section number, as appropriate.
- E. Submit Material Safety Data Sheets with each submittal.

- F. Coordinate and schedule submittals to expedite the project.
- G. Deliver all electronic and hard copies of the submittals to the architect's business address.

1.5 SCHEDULE OF VALUES

- A. Using AIA Form G703 - Application and Certificate for Payment, Continuation Sheet, submit Schedule of Values to Architect at least twenty (20) days before the first application for payment.
- B. Submit Schedule of Values within twenty (20) days after date established in Notice to Proceed.
- C. Use the Table of Contents to establish Schedule of Values format. Identify each line item with number and title of the specification section.
- D. Include in each line item any amount of Allowances specified in the project.
- E. Include within each line item Contractor's overhead and profit.
- F. Each application, revise the schedule as necessary to include approved contract changes to date.

1.6 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial progress schedule within twenty (20) days after date established in Notice to Proceed.
- B. Revise and resubmit schedule as required to reach an agreed schedule and completion date.
- C. Submit revised schedules with each Application for Payment, identifying ahead of schedule or behind schedule changes since previous month's schedule.
- D. Submit a horizontal bar chart with separate line for each major section of work or operation, identifying first work day of each week.
- E. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration of the task or operation.
- F. Indicate estimated percentage of completion for each item of work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, sample reviews, and product delivery dates, including those that may be furnished by owner and / or included as an allowance.

1.7 APPLICATIONS FOR PAYMENT

- A. Submit one electronic copy of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet.
- B. Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment period to be as defined in Owner-Contractor Agreement.
- D. Include any request for extension of the contract time with each pay application. Do not assume that accumulated unrequested days will be granted as the project's contracted time expires.

1.8 SHOP DRAWINGS

- A. Refer to Section 00100, Instructions to Bidders, paragraph 3.6, for submittal schedule.
- B. Submit shop drawings with all product literature, product data sheets, color charts, and / or photographs in a bound paper or electronic copy.
- C. If submitting in paper format, submit the number of copies which the contractor requires, plus **three** copies which will be retained by the architect, engineer, and owner.
- D. Regardless of whether electronically submitted or physically submitted, Mark in **GREEN INK** each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this project. The architect's review comments will be in **RED INK**.
- E. Apply contractor's stamp, signed, or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and contract documents. Submittals delivered to the architect for review that have not been stamped and initialed will be returned without review.
- F. Identify variations from contract documents and product or system limitations which may be detrimental to successful performance of the completed work.
- G. Provide space for architect's review stamps.
- H. Revise and resubmit shop drawings as required, identify all changes made since previous submittal. Re-submittal shall continue to use the same identification number as the original submittal plus the letter "R" for re-submittal and R 1, R 2, R 3, etc. for multiple re-submittals.
- I. Distribute copies of reviewed and approved shop drawings to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- J. Provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.9 SHOP DRAWING REVIEW

- A. All may be submitted electronically.
- B. The architect and engineer shall affix a stamp upon the submittal with appropriate wording stating if submittal is accepted, accepted with noted revisions, revise and re-submit, or rejected. Rejected submittals are to be addressed promptly and a new submittal prepared.
- C. The architect shall provide copies of the submittal to the owner for the owner's review at the same time the architect is reviewing shop drawings.
- D. The contractor shall not begin work or order material for which a submittal is required until a submittal has been stamped accepted or accepted with noted revisions and returned to the contractor.
- E. Schedule submissions at least fourteen (14) working days before date reviewed submittal will be needed by contractor. The architect shall be allowed fourteen (14) working days for each submittal review.
- F. The architect shall notify the contractor when submittals are reviewed and ready for inclusion into the project.

- G. The architect shall review the same shop drawing submittal no more than two times. If more than two submittals are required in order to achieve an accepted submittal, the contractor shall be charged \$100.00 per hour for each review beyond the initial two. The architect's review fee shall be paid by the contractor in full prior to the release of the accepted shop drawings.

1.10 SAMPLES

- A. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing with work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors or in custom colors selected, textures, and patterns for architect's selection.
- C. Include identification on each sample, with full project information.
- D. Submit the number or samples specified in individual specification sections. Provide at least **two** copies of each item being submitted for review and selection. These copies will not be returned.
- E. Reviewed samples which may be used in the work are indicated in individual specification sections.

1.11 CHANGE PROCEDURES

- A. The Architect may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and a change in Contract Time for executing the change. Contractor will prepare and submit an estimate within seven (7) days.
- B. The Contractor may propose a change by submitting request for change to the Architect, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01600.
- C. Architect may issue a directive, on AIA form G713 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.
- D. Architect will issue Change Orders, using AIA G701 - Change Order, for signatures of all parties as provided in the Conditions of the Contract.
- E. Contract amendments or change orders are not approved and no action shall be taken until the Ki Corp Executive Director has agreed and signed the document. A copy of the signed document will be provided to the contractor for execution of the work.

1.12 MANUFACTURERS INSTRUCTIONS

- A. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.
- B. Identify conflicts between manufacturers' instructions and contract documents to the architect.

1.13 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification sections, submit manufacturers' certificate to architect for review, in quantities specified for product data.
- B. Indicate that material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to architect and / or engineer.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

END OF SECTION

SECTION 01 43 00
QUALITY CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Field samples.
- D. Inspection and testing laboratory services.

1.3 RELATED SECTIONS

- A. Section 01090 - Reference Standards.
- B. Section 01300 - Submittals: Submission of Manufacturers' Instructions and Certificates.
- C. Section 01600 - Material and Equipment: Requirements for material and product quality.
- D. Individual Specification Sections: Inspections and tests required and standards for testing.

1.4 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with contract documents, request clarification from architect before proceeding with work.
- D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.5 REFERENCES

- A. Conform to reference standard by date of issue current on date of contract documents.
- B. Obtain copies of standards when required by contract documents.

- C. Should specified reference standards conflict with contract documents, request clarification from architect before proceeding with work.
- D. The contractual relationship of the parties to the contract shall not be altered from the contract documents by mention or inference otherwise in any reference document.
- E. ANSI/ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials Used in Construction.

1.6 FIELD SAMPLES

- A. Install field samples at the site as required by individual specifications sections for review.
- B. Acceptable samples represent a quality level for the work.
- C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by architect.

1.7 OWNER'S INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner may employ and pay for services of an independent testing laboratory or owner may use its own personnel and facilities to perform inspection and testing laboratory services.
- B. If the results provided by the Owner's laboratory differ from the contractor's laboratory report, the owner's laboratory shall be final.
- C. Work found to be unsatisfactory according to test results, shall be removed from the project and re-constructed at contractor's expense.

1.8 CONTRACTOR'S INSPECTION AND TESTING LABORATORY SERVICES

- A. The Owner shall employ and pay for a reputable testing laboratory to perform inspections, tests, and other services specified in individual specification sections and as required by the architect.
- B. Reports will be submitted directly to the architect and owner from laboratory, in duplicate, indicating observations and results of test and indicating compliance or non-compliance with contract documents. Copies of reports shall also be sent to the contractor for his use.
- C. Cooperate with testing laboratory: furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 1. Notify testing laboratory 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with testing laboratory and pay for additional samples and tests required for contractor's use.
- D. Retesting required because of non-conformance to specified requirements shall be performed by the same testing laboratory on instructions by the architect. Payment for retesting will be charged to the contractor by deducting inspection or testing charges from the contract sum.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 50 00
CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work in this Section.

1.2 SECTION INCLUDES

- A. Sanitary Facilities: Contractor's employees.
- B. Temporary Utilities: Electrical, water, sewer, gas and telephone.
- C. Field Offices: Services and size.
- D. Temporary Controls: Barriers, enclosures and fencing, and protection of the work.
- E. Construction Facilities: Parking, progress cleaning, and project signage.

1.3 RELATED SECTIONS

- A. Section 01700 - Contract Closeout: Final cleaning.

1.4 TEMPORARY SANITARY FACILITIES

- A. Existing or newly constructed toilet facilities may be used by construction crews.
- B. General Contractor is responsible for maintaining toilets clean and in a neat appearance.

1.5 TEMPORARY UTILITIES

- A. Contractor shall furnish and install all temporary piping and wiring required for construction.
- B. New and modified existing service is anticipated for this project.
- C. All temporary utility connections and distribution shall be approved by owner and respective local utility companies, and shall be removed by contractor at completion of construction.

1.6 TEMPORARY FIELD OFFICES

- A. Space within the existing building shall be reserved for field office use.
- B. Facility shall be large enough to allow for at least three people to stand and meet comfortably.

1.7 BARRIERS

- A. Provide suitable barriers to prevent unauthorized entry to construction areas while still allowing access for owner's use of site. Protect existing facilities and adjacent properties from damage during construction operation and demolition. Type of barrier to be used will be at the discretion of the contractor and the circumstance involved. The contractor to submit proposed barrier for review and approval by owner.

- B. Protect stored materials, site, and structures from damage.
- C. Clearly post warning signs all around the work sites. Signs are to be secured to the barriers.
- D. Suitable barriers include durable solid partitions, chain-link fences, temporary dust and acoustic partitions and woven fabric. Suitable barriers do not include ropes or warning tape tied to saw horses or similar devices.
- E. Prohibit traffic through work areas.

1.8 WATER CONTROL

- A. Since this is mostly an interior renovation project and there is an established exterior, no additional exterior water control is anticipated.

1.9 PROTECTION OF INSTALLED WORK

- A. Protect installed work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in the immediate work area so as to minimize damage of installed work.

1.10 PROTECTION OF LANDSCAPING

- A. Prohibit construction worker traffic through any established landscaped areas. Damaged landscape shall be replaced by the contractor at no cost to owner.

1.11 SECURITY

- A. Contractor shall provide security and facilities to protect work, existing facilities, and owner's operations directly adjacent to new construction from unauthorized entry, vandalism, or theft.
- B. The loss of building materials and/or equipment from the job site will be replaced with same at contractor's expense.
- C. If necessary, the contractor shall coordinate with City of Lubbock to secure a permit for a construction dumpster and space.

1.12 PARKING

- A. All Contractor's and sub-contractor's vehicle parking is available West or North of ANB Commercial Vault.
- B. Construction access is from the west and east side of the building.
- C. When site space is not adequate, the contractor shall acquire additional off-site parking.

1.13 PROJECT SIGNAGE

- A. No project sign is necessary. Sign may be provided at contractor's expense.

1.14 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean, orderly condition. Do not allow lawns or weeds to grow taller than six inches.
- B. Remove waste materials, debris, and rubbish daily, empty dumpster weekly, and dispose off-site.
- C. Do not allow hazardous conditions to develop or continue. This shall include lumber with unpulled nails and concrete with projecting rebar.

1.15 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Clean and repair damage caused by installation or use of temporary work.
- B. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.16 HAUL ROUTE

- A. All materials, tools, equipment, etc. shall be transported via the shortest possible route.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 60 00
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

1.3 RELATED SECTIONS

- A. Instruction to Bidders: Product options and substitution procedures.

1.4 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the work. Products may also include existing materials or components required for salvage and reuse.
- B. Do not reuse materials and equipment removed from existing premises, except as specifically permitted by the contract documents or as approved by the architect.
- C. For similar components provide interchangeable components of the same manufacturer.
- D. All materials are to be certified by the contractor to be asbestos-free. Provide written certification to owner as part of close out documents.

1.5 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 1. Deliver materials, products and equipment to the project site in undamaged condition in manufacturer's original unopened containers or packaging with identify labels intact and legible.
 2. Arrange deliveries in accordance with the construction schedule and in ample time to facilitate inspection prior to installation in order to avoid unnecessary delays in the construction process.
 3. Delivery of construction material and removal of construction debris shall occur after normal business hours only.

- B. Storage:
 1. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
 2. For exterior storage of fabricated products, place on sloped supports, above ground.
 3. Provide off-site storage and protection when site does not permit on-site storage or protection.
 4. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
 5. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.
 6. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
 7. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

- C. Handling:
 1. Handle materials, products and equipment in a manner prescribed by the manufacturer or as required to protect from damage during storage and installation.
 2. Do not handle material in such a way that may leave permanent scars, dents, impressions, cracks, or blemishes.

1.7 PRODUCT OPTIONS

- A. Products specified by reference standards or by description only: Any product meeting those standards or description.
- B. Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named.

1.8 SUBSTITUTIONS

- A. Instructions to bidders specify time restrictions for submitting requests for substitutions during the bidding period to requirements specified in this section.
- B. Substitutions may be considered after the bid date only when a product becomes unavailable through no fault to the contractor.
- C. Owner's advantage to select substitution submitted by contractor based on either cost and/or quality.

- D. Document each request with complete data substantiating compliance of proposed substitution with contract documents.
- E. A request constitutes a representation that the contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - 2. Will provide the same warranty for the substitution as for the specified product.
 - 3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse for review or redesign services associated with re-approval by authorities.
- F. Will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the contract documents.
- G. Substitution Submittal Procedure:
 - 1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product's equivalence.
 - 3. The architect, after consultation with owner, will notify contractor, in writing, of decision to accept or reject request.

1.9 CONTRACTOR'S CONSTRUCTION METHODS OPTIONS

- A. Where contract documents indicate no specific method of construction, the contractor shall employ standard industry practices.
- B. Where contract documents indicate a specific method of construction, the contractor shall employ the method indicated or, at his option, may submit a written request for an alternate method of construction.
- C. Architect/engineer will consider written requests for alternate construction methods, if received in time as to allow for review and return of such requests and for alternation to be made with no delay to total construction methods. See contract for total working days allowed.
- D. Submit separate requests for each alternate. Support each request with three copies of complete details and/or documentation for alteration.
 - 1. Indicate changes of materials to be used.
 - 2. Show significant effects of alterations to other affects of alterations to other affected areas.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjustments.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Warranties and Certificates.
- G. Texas Accessibility Standards Warranty.
- H. Spare parts and maintenance materials.
- I. Starting of systems.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that contract documents have been reviewed, work has been inspected, and that work is complete in accordance with contract documents and ready for architect's inspection.
- B. Final payment will be authorized only after all requirements of this section have been met, all punch list items have been completed and verified by the architect, updated record documents have been delivered to the architect, and complete operation and maintenance manuals have been delivered to the architect. Submit final application for payment identifying total adjusted contract sum, previous payments, and sum remaining due.
- C. Contractor to submit to owner Payment Waivers or Release of Liens signed and dated by all subcontractors along with request for final payment.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to a new and sanitary condition.
- D. Replace all filters of operating equipment with new, clean filters. Provide owner with one complete set of all filters required for all equipment.

- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas and rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 ADJUSTMENTS

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. If adjustments cannot provide a smooth and unhindered operation, replace product with matching item that will operate correctly.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the work:
 1. Contract drawings.
 2. Specifications.
 3. Addenda.
 4. Change orders and other modifications to the contract.
 5. Accepted shop drawings, product data, and samples.
- B. Store record documents separate from documents used for construction.
- C. Record information concurrent with construction progress. Do not wait to update Record Documents at the end of work, update as work progresses.
- D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by addenda and modifications.
- E. Record documents and shop drawings: Legibly mark each item to record actual construction, showing any and all modifications, including:
 1. Measured depths of foundations in relation to finish main floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
 4. Field changes of dimension and detail.
 5. Details not on original contract drawings.
- F. Submit Record Documents to architect prior to claim for final payment. Architect to transfer information to original drawings and deliver to owner.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit one complete paper copy and two electronic sets of operation and maintenance data at least 2 weeks prior to final inspection. Paper format is to be organized on 8-1/2 x 11 inch pages, bound in three ring binders with durable plastic covers. Electronic format is to follow the paper format's organization and be submitted on labeled CD's in clear plastic cases.
- B. Prepare binder covers with printed title "Operation and Maintenance Instructions", title of project, and subject matter of binder when multiple binders are required.
 1. Label multiple binders as "Volume I of II" and Volume II of II", as appropriate.

- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.
- E. Part 1: Directory, listing names, addresses, and telephone numbers of architect, contractor, subcontractors, and major equipment suppliers.
- F. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
 - 1. Significant design criteria.
 - 2. List of equipment, make, model, and serial number. Verify that numbers are correct.
 - 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.
- G. Part 3: Project documents and certificates, including the following:
 - 1. All approved shop drawings and product data.
 - 2. Hauling and dumping permits, receipts, and/or manifest.
 - 3. Air and water balance reports two (2) weeks prior to final inspection.
 - 4. Written statement certifying that all building materials installed in project are asbestos free.
 - 5. Natural gas pressure test and certification.
 - 6. Contractors' Affidavit of Payment of Debts and Claims. Use latest version of AIA Documents G706 and G706A.
 - 7. Certificates issued by the architect; change orders, addenda, field reports, etc.
 - 8. Photocopies of manufacturers' warranties and bonds.
 - 9. General Contractor's and Sub-Contractors' warranties.

1.8 WARRANTIES AND CERTIFICATES

- A. Provide original warranties and certificates in a bound, 3 ring binders to the owner. Label the binder "Warranties and Certificates" with project name.
- B. Where specifications request warranties and certificates, provide such items requested. Warranties are required from each of the major sub-contractors, those who are responsible for a building system installed in the building.
- C. Provide required certifications requested by state and local governing agencies.
- D. The following are known Texas Department of Health required certificates, other certificates may be required.
 - 1. Flame spread/smoke density ratings of carpets.
- E. Provide a written warranty on contractor's business letterhead stating that the work is warranted against defects in material and labor for a period of one year from date of final acceptance. This is not the date of substantial completion.

1.9 TEXAS ACCESSIBILITY STANDARDS WARRANTY

- A. A Texas Department of Licensing and Regulations inspector will walk the site within approximately one year of the completion date. The contractor shall warrant that if, after this walk through, there are

items provided and installed by the contractor that do not comply with the code, the contractor shall provide the necessary labor and material to correct the unacceptable items. If the construction documents provided the correct information and this information was not followed, the corrective work shall be at the contractor's expense. If the corrective work is necessary due to changes in the code or omission on the documents, circumstances beyond the contractor's control, the work is to be priced at a fair market value.

- B. The contractor's warranty shall state that any necessary corrective work associated to the Texas Accessibility Standards shall be completed within 30 days of written notification that the installed work did not pass the Texas Department of Licensing and Regulations inspection.
- C. If for some reason the contractor or sub-contractor does not believe that a given dimension or installation detail is in compliance with the Texas Accessibility Standard, the contractor is obligated to bring this concern to the architect's attention prior to performing said work.

1.10 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.
- B. Deliver to project site and place in location as directed by owner and obtain receipt prior to final payment.

1.11 STARTING OF SYSTEMS

- A. Preparation:
 1. Notify architect and owner seven days prior to start-up of each system.
 2. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.
 3. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
 4. Verify wiring and support components are complete and tested.
 5. Execute start-up under supervision of responsible manufacturer's and owner's representatives in accordance with manufacturer's instruction.
 6. Demonstrate start-up, operation, control, adjustment, trouble shooting, servicing maintenance and shutdown of each piece of equipment to owner's personnel two weeks prior to date of final inspection.
 7. Amount of time to be devoted to instruction shall be reasonable and consistent with size of installation and its complexity.

PART 2 PRODUCTS
NOT USED

PART 3 EXECUTION
NOT USED

END OF SECTION

SECTION 02 42 13

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Dust control.
- B. Protection.
- C. Availability of work areas.

1.3 RELATED SECTIONS

- A. Section 01500 - Construction Facilities.

1.4 SUBMITTALS

- A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for approval. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. The procedures shall include detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

1.5 GENERAL REQUIREMENTS

- A. The work includes demolition or removal of existing construction indicated or specified. All materials resulting from demolition work, except as indicated or specified otherwise, shall become the property of the contractor and shall be removed from the limits of owner's property within five working days of dismantling.
- B. Maintain a clean and organized job site throughout the demolition phase of the work.
- C. Coordinate the removal of any security devices with the owner's security representative.
- D. Coordinate construction routes through existing, undisturbed portions of the facility with the architect prior to beginning demolition.

1.6 DUST CONTROL

- A. The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the building and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.
- B. Maintain barriers until that portion of the project is complete.

1.7 PROTECTION

- A. Protection of Existing Work: Before beginning any demolition work, the contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of the work. The contractor shall take all necessary precautions to ensure against damage to existing work to remain in place, any damage to such work shall be repaired or replaced at no additional cost to the owner. The contractor shall carefully coordinate the work of this section with all other work and construct and maintain shoring, bracing and supports, as required.
- B. Protection of Trees: Trees within the project site which might be damaged during demolition and which are indicated to be left in place shall be suitably protected. Any tree that is damaged during the work under this contract shall be replaced.
- C. Isolate demolition areas from occupied portions of the building with suitable barriers. Suitable barriers include those described in and Part 2 of this section.

1.8 AVAILABILITY OF WORK AREAS

- A. Areas in which demolition work is to be accomplished will be available in accordance with the provisions of these specifications. Coordinate work with owner's activities. Restrict unauthorized access to the project site, unless other wise instructed by the architect.

PART 2 PRODUCTS

2.1 DUST BARRIERS (where required)

- A. Minimum of 12 mil polyethelene sheets adequately secured to supports with duct tapes, staples, cleats, nails, etc. Replace sheet if tears or holes can not be closed satisfactory.
- B. Provide an access door in dust barrier that can be locked or secured close.
- C. Brightly colored warning signs are to be attached to barrier and continually maintained throughout the life of the barrier.

2.2 ACOUSTIC BARRIERS (where required)

- A. Minimum of 5/8" thick gypsum wall board secured to metal or wood studs. Place an acoustic foam gasket between the adjacent surfaces and the barrier. Maintain the barrier throughout the demolition phase of the work.
- B. Provide an acoustically sound access door in barrier that can be locked or secured closed.
- C. Brightly colored warning signs are to be attached to barrier and continually maintained throughout the life of the barrier.

2.3 FENCING (where required)

- A. Use a minimum of construction grade chain link fabric on a metal frame. Fencing may be modular panels secured together and to the adjacent material or metal stakes with fabric stretched across them.
- B. Provide an access gate suitable for personnel and equipment to pass through with can be locked or secured close.

- C. Brightly colored warning signs are to be attached to barrier and continually maintained throughout the life of the barrier.

PART 3 EXECUTION

3.1 EXISTING FACILITIES

- A. Existing Surfacing: Existing floors and wall surfaces that are to remain are not to be damaged during demolition. Protect from damage with suitable measures.
- B. Other Facilities: Remove within the limits shown to a logical and straight termination as noted on the drawings.
- C. Temporary: Those materials noted to be temporarily removed, to allow access to areas affected by this work and then re-installed to match existing adjacent materials, shall be protected from damage and stored on site as directed.

3.2 DISPOSITION OF MATERIALS

- A. Title to Materials: Title to all materials and equipment to be demolished is vested in the contractor upon receipt of notice to proceed. Items noted to be salvaged shall be returned to the owner and stored as directed.
- B. Disposition: All materials resulting from demolition shall be disposed by the contractor in accordance with all applicable laws, codes, and ordinances.

3.3 CLEAN-UP

- A. Debris and Rubbish: Debris and rubbish shall be removed from work sites on a regular basis. Only by prior approval of the architect will debris and rubbish be allowed to accumulate on the site for more than a week.
- B. Debris Control: Debris shall be removed and transported in a manner as to prevent spillage on streets or adjacent areas.
- C. The contractor is not permitted to use owner's refuse containers.
- D. Regulations: Applicable federal, state and local regulations regarding hauling and disposal apply. Provide copies of hauling and dumping permits, receipts, or manifest to architect. Include copies in operations and maintenance manual.
- E. Cleanliness of Site: Due to the high visibility of the site and potential danger to the public, maintaining a clean and safe site will be critical.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, and Supplementary General Conditions apply to work of this Section.

1.2 SECTION INCLUDES

- A. Concealed fire resistant wood blocking in walls; wood furring and grounds for grab bars.

1.3 RELATED SECTIONS

- A. Section 10800 - Toilet Accessories.
- B. Section 06400 – Architectural Millwork

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with the following agencies:
 - 1. Lumber Grading Agency: Certified by ALSC.
 - 2. Plywood Grading Agency: Certified by APA.
- B. Meet or exceed ASTM E 84 criteria.
- C. Meet or exceed UL 723:PR-S criteria.

PART 2 PRODUCTS

2.1 LUMBER MATERIALS

- A. Lumber Grading Rules: NFPA, WWPA.
- B. Fire resistant treated 2 x 6: NFPA.

2.2 SHEATHING MATERIALS

- A. Plywood Sheathing: APA Rated Sheathing; sanded.
- B. Particleboard Sheathing: Not allowed on this project.

2.3 UNDERLAYMENT MATERIALS

- A. Plywood Underlayment: APA Rated Sheathing; sanded.
- B. Particleboard Underlayment: Not allowed on this project.

2.4 ACCESSORIES

- A. Fasteners: Galvanized steel for exterior, high humidity, and treated wood locations, plain finish elsewhere.

- B. Die Stamped Connectors: Galvanized steel.
- C. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorage to steel.

2.5 WOOD TREATMENT

- A. Fire retardant: AWPA Treatment C20, Exterior Type, chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 or less.
- B. D-Blaze, Bowie-Sims-Prange Treating Corporation.
- C. Wood Preservative (Pressure Treatment): AWPA Treatment C1 using water-born preservative with 0.25 percent retainage.

PART 3 EXECUTION

3.1 FRAMING

- A. Erect wood members in accordance with applicable code. Place members level and plumb.

3.2 SITE APPLIED WOOD TREATMENT

- A. Site apply preservative treatment in accordance with manufacturer's instructions.
- B. Allow preservative to cure prior to erecting members.

3.3 CONCEALED GROUNDS

- A. Provide fire resistant concealed grounds in framing as required for secure anchoring of wall mounted building components.

END OF SECTION

SECTION 061600

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Parapet sheathing.
 - 4. Composite nail base insulated roof sheathing.
 - 5. Subflooring.
 - 6. Underlayment.
 - 7. Sheathing joint and penetration treatment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated plywood.
 - 2. Fire-retardant-treated plywood.
 - 3. Foam-plastic sheathing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the 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."

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying 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 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 (3.2 m) beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all plywood at exterior overhang or soffit structure
- 2.4 WALL SHEATHING
- A. All of the following are acceptable wall sheathing. Coordinate with cladding systems to insure that chosen sheathing is acceptable to cladding manufacturer.
- B. Plywood Sheathing: Exterior sheathing.
- C. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1 sheathing.
- D. Paper-Surfaced Gypsum Sheathing: ASTM C1396/C1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.
1. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
- E. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.
1. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
- F. Cellulose Fiber-Reinforced Gypsum Sheathing: ASTM C1278/C1278M, gypsum sheathing.
1. Product: Subject to compliance with requirements, provide "Fiberock Sheathing with Aqua-Tough" by United States Gypsum Co.
 2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
- G. Cementitious Backer Units: ASTM C1325, Type A.
1. Thickness: 1/2 inch (12.7 mm).
- 2.5 ROOF SHEATHING
- A. Plywood Sheathing: Exterior sheathing.
- B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1 sheathing.
- 2.6 PARAPET SHEATHING
- A. Plywood Sheathing: , Exterior sheathing.
- B. Oriented-Strand-Board Sheathing: DOC PS 2, Exposure 1 sheathing.
- C. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Type and Thickness: Regular, 1/2 inch (13 mm) thick.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. For parapet and wall sheathing, provide fasteners.
 2. For parapet and wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Paper-Surfaced Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.
- C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.

3. ICC-ES evaluation report for fastener.

- D. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to wood framing with nails or screws.
 - 2. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
 - 4. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, and Supplementary General Conditions apply to work of this Section

1.2 SECTION INCLUDES

- A. Plastic-laminate-faced architectural cabinets.
- B. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products high-pressure decorative laminate adhesive for bonding plastic laminate fire-retardant-treated materials and cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
 - 1. Plastic laminates, for each color, pattern, and surface finish.

1.4 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. Type of Construction: Frameless.
 - 1. Cabinet, Door, and Drawer Front Interface Style: Reveal overlay
- D. Reveal Dimension: 1/2 inch (13 mm).
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

- F. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Formica Corporation.
 2. Wilsonart International Holdings, Inc.
- G. Laminate Cladding for Exposed Surfaces:
1. Horizontal Surfaces: Grade HGS.
 2. Postformed Surfaces: Grade HGP.
 3. Vertical Surfaces: Grade HGS.
 4. Pattern Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
- H. Materials for Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 3. Drawer Bottoms: Thermoset decorative panels.
- I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
- PL1 – to be selected by architect from manufacturer’s FULL range of colors and textures
 - PL2 – to be selected by architect from manufacturer’s FULL range of colors and textures

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.
 2. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - a. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - b. Particleboard: ANSI A208.1, Grade M-2.
 - c. Softwood Plywood: DOC PS 1, medium-density overlay.
- B. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying 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. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

- C. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, 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.
- D. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2.4 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Cabinet hardware as follows:
 - 1. Semi-concealed Hinges for Overlay Doors: BHMA A156.9, B01521.
 - 2. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
 - 3. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
 - 4. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
 - 5. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
 - 6. Drawer Slides: BHMA A156.9.
 - a. Grade 1 and Grade 2: Side mounted; full-extension type; with polymer rollers.
 - b. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
 - c. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - d. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
 - e. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100 Grade 1HD-200.
 - f. For computer keyboard shelves, provide Grade 1HD-100.
 - g. For trash bins not more than 20 inches (500 mm) high and 16 inches (400 mm) wide, provide Grade 1HD-100.
- D. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- C. Door Locks: BHMA A156.11, E07121.
- D. Drawer Locks: BHMA A156.11, E07041.
- E. Door and Drawer Silencers: BHMA A156.16, L03011.
- F. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, with exposed edges seamed before tempering, 6 mm thick unless otherwise indicated.
- G. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.
- H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. .Satin Stainless Steel: BHMA 630.

2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber], kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Adhesive for Bonding Plastic Laminate: wood worker's option.
- F. Adhesive for Bonding Edges: Hot-melt adhesive.

2.6 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- C. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinet's level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

END OF SECTION 064116

SECTION 07 21 16

BATT, BLANKET, AND RIGID INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work in this Section.

1.2 RELATED WORK

- A. Provide un-faced acoustic batt insulation in partitions where shown on the drawings.

1.3 RELATED SECTIONS

- A. Section 06100: Rough Carpentry.
- B. Section 09260: Gypsum Board Systems.

1.4 QUALITY ASSURANCE

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1 inch thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature causing one BTU to flow through one square foot per hour at mean temperatures indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Contractor shall be an established firm regularly engaged in installation of wall insulations for the past five years.

1.5 REFERENCE STANDARDS

- A. Surface Burning Characteristic: ASTM E 84.
- B. Fire Resistance Ratings: ASTM E 119.
- C. Combustion Characteristics: ASTM E 136.
- D. Thermal Performance: ASTM C653.
- E. Acoustical Performance: ASTM C665.

1.6 SUBMITTALS

- A. Submit manufacturer's specifications and installation instructions for each type of insulation required. Include data substantiating that materials comply with specified requirements.

- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings, and similar properties.
- C. Submit support material and anchor hardware for vertical and horizontal installations.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation. All materials damaged from above instances will not be used and will be disposed of properly from the site.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Rigid Insulation:
 1. Owens/Corning Corporation.
 2. CertainTeed
- B. Batt Insulation:
 1. Owens/Corning Corporation.
 2. CertainTeed
- C. Substitutions:
 1. In accordance with Section 01600.

2.2 MATERIALS

- A. Sound attenuation batts to be equal to Owens/Corning un-faced batt for 3 1/2 inch thick cavity, Tested in accordance with ASTM E84. Unfaced: Flame Spread 0 and Smoke Developed 0. Thermafiber SAFB or equal.
- B. Insulation above ceiling, installed within the joist depth on poultry netting or equal method to secure snug to roof deck, shall be 9 inch KRAFT faced batts with a minimum R-value of 30.0 at 75 degrees F mean temperature as indicated on the drawings. Flame spread of 0-25, smoke developed of 50.
- C. Insulation in exterior cavity masonry walls shall be rigid extruded polystyrene insulation. The insulation thickness shall be 2 inches. Thermal Resistance ("R" value) shall be 10.0 at 75 degrees F. mean temperature. Insulation shall be compatible with dampproofing. Exterior surface to be completely and uniformly coated with dampproofing.
- D. Insulation in exterior stud walls to be Owens/Corning 6 inches KRAFT faced batts with a minimum R-value of 19.0 at 75 degrees F. mean temperature as indicated on the drawings. Flame spread of 0-25, smoke developed of 50.
- E. Adhesive for Bonding Insulation board shall be the type recommended by the insulation manufacturer, and complying with fire-resistance requirements.
- F. Mechanical Anchors shall be the type and size shown or, if not shown, as recommended by the insulation manufacturer for the type of application shown and condition of substrate

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect cavity wall surfaces prior to starting insulation work. Proceeding with installation constitutes acceptance of the substrate.
- B. The installer must examine the substrate and the conditions under which the insulation work is to be performed and notify the contractor in writing of unsatisfactory conditions. Do not proceed with the insulation work until substrate is satisfactory.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions for the particular conditions of installation in each case; including method of support or anchorage to the substrate, as appropriate for each application indicated. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
- B. Extend insulation full thickness as shown over entire surface to be insulated. Cut and fit tightly around obstructions.

END OF SECTION

SECTION 07 46 16

ALUMINUM SIDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aluminum siding and soffits, with digitally printed finish
- B. Accessory products including
 - 1. Starter Strips
 - 2. Two-Piece Corners and Trim

1.2 PREINSTALLATION MEETING

- A. Preinstallation Meeting: Conduct meeting at Project Site

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, include the following
 - 1. Technical data,
 - 2. Installation Instructions
 - 3. Aluminum material information
 - 4. UV Fade Test Reports, by a 3rd Party Testing Agency.
 - 5. Siding and accessory dimension of components and profiles
- B. Digital Color and Texture Card showing the variation within selected color and texture
- C. Samples: Printed siding plank (or printed carton) to match digital color and texture card

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates: For each type of aluminum siding and soffit.
- B. Sustainable Design Submittals:
 - 1. Sourcing of Raw materials: Building Product Disclosure and Optimization indicating source and extraction.
- C. Sample warranty: For special finish

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data: For each type of product, including related accessories. Include in Maintenance manuals.
- B. Warranty: Executed copy of the manufacturer's warranty.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockups for siding and soffit including accessories
 - a. Size: 72 square feet, from sample carton, unless noted otherwise.
 - b. Include outside corner on one end of mockup and inside corner on opposite end.

2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - B. Surface Burning Characteristics: In accordance with ASTM E84
 1. Flame Spread Index: 0
 2. Smoke Developed Index: 0

1.7 WARRANTY

- A. Special Warranty: Manufacturer warrants its aluminum siding and soffits are free of defects in material and workmanship, and when applied and maintained according the manufacturer's instructions, the products are guaranteed against
 1. Buckling
 2. Corrosion
- B. Finish Warranty: Manufacturer includes the primer, high definition printed layer and clear protective coating. Finish is warranted to have the following properties
 1. Resistance to Cracking and Crazing
 2. Color Retention: No change in the color of the finish on the building – greater than 5 units
 3. Gloss Retention of a least 30 percent of the original
 4. Adhesion: Digital printed finish will not peel from substrate.
- C. Warranty Period: 25 years from date of Substantial Completion, non-prorated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. DIZAL Inc., 4000 Jean-Marchand Street, Unit 108, Quebec City, Quebec Canada G2C 1Y6. www.DIZAL.com
- B. Longboard, [Contact Us - Longboard Architectural Products \(longboardproducts.com\)](http://Contact Us - Longboard Architectural Products (longboardproducts.com)), 1-800-604-0343. info@longboardproducts.com.
- C. KNOTWOOD, Contact - KNOTWOOD ALUMARCH.COM - Knotwood - Canada - US, 1-888-589-9771
- D. Substitutions allowed.

2.2 ALUMINUM MATERIAL

- A. Extruded Aluminum 6063-T5 alloy

2.3 ALUMINUM SIDING AND SOFFIT PLANKS

- A. Profile F: Flat Plank
 1. Exposed Face: 6 inches; minimum metal thickness: 0.062 inch
 2. Plank Length: 16 feet

2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
 1. Provide accessories made from same material and matching finish of adjacent siding unless otherwise indicated.

- B. Aluminum Accessories: Where aluminum accessories are indicated, provide two-piece trim pieces including.
 - 1. Starter Strip
 - 2. J-Trim 1 and 1-3/4 inch
 - 3. H-Trim
 - 4. Outside Corner
- C. Fasteners: Stainless Steel screws. Clip fasteners are not acceptable.

2.5 DIGITALLY PRINTED FINISH

- A. Three-layer color and texture finish including
 - 1. Primer coat: for applied to aluminum for adhesion between ink and aluminum
 - 2. High-Definition digital inkjet printing to create photographic reproductions of colors and textures. Printing to be continuous to aluminum profile edge.
 - 3. UV Barrier: Protective Clear Coat for UV protection against fading.
 - a. UV Fade Test: No change in 1000 hours when tested in accordance with ASTM G155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials, when tested by a 3rd Party Testing Agency.
- B. Color to match DIZAL line and to be selected from full range of colors with a minimum of (6 to 9) differing planks to reduce repetition of print.
- C. Acceptable products: “DIZAL” digitally printed aluminum siding or architect approved equivalent prior to bid

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of aluminum siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Center fasteners in elongated, clipless fastening slots, fasten without binding siding to allow for thermal movement.
- B. Install aluminum siding and soffit and related accessories according to manufacturer recommendations
 - 1. Install fasteners no more than 16 inches o.c.
Where plank ends butt together (fasten each plank with 1 set screw, fastened through the metal) locate set screw so that plank movement is allowed at ends opposite the butt joint.
 - 2. Allow 3/16 inch for expansion and contraction between trim and planks.
- C. Where aluminum siding contacts dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 54 23

THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work in this Section.

1.2 GENERAL NOTES

- A. This contract shall include all single ply roofing, rigid roof insulation, sheetmetal flashings required to complete the work as specified herein and called for on the drawings.
- B. For the purpose of establishing a standard, the products of the Carlisle Syntec, Inc. Alternate products of equal quality will be considered subject to the final approval of the architect and acceptance of the owner.

1.3 GENERAL DESCRIPTION

- A. The project consists of installing Carlisle's Sure-Weld white FleeceBACK 115 membrane adhered with Flexible FAST Adhesive as outlined below:
 - 1. Apply the Sure-Weld FleeceBACK Adhered Roofing System in 5/8" Securok.

1.4 RELATED SECTIONS

- A. Section 07015 – Preparation for Re-roofing
- B. Section 07900 - Joint Sealers.

1.5 EXTENT OF WORK

- A. Provide all labor, materials, tools, equipment, and supervision necessary to complete the installation of the Sure-Weld FleeceBACK Adhered Roofing System including flashings and insulation as specified herein and as indicated on the drawings in accordance with the manufacturer's most current specifications and details.
- B. The roofing contractor shall be fully knowledgeable of all requirements of the contract documents and shall make themselves aware of all job site conditions that will affect their work.
- C. The roofing contractor shall confirm all given information and advise the building owner, prior to bid, of any conflicts that will affect their cost proposal.
- D. Any contractor who intends to submit a bid using a roofing system other than the approved manufacturer must submit for pre-qualification in writing fourteen (14) days prior to the bid date. Any contractor who fails to submit all information as requested will be subject to rejection. Bids stating "as per plans and specs" will be unacceptable.

1.6 NOTIFICATION

- A. The architect, in conjunction with the owner, shall set a date and time for a pre-roofing conference. To coincide with the preconstruction conference.
- B. All roofing materials intended to be used on this project shall be reviewed by the architect and owner at the job site during the pre-roofing conference. The roofing contractor shall have at least a portion of all materials to be used on the project available at the job site during the conference.
- C. All flashing and termination details shall be in accordance with roofing manufacturer warranty requirements and shall be reviewed by the architect and owner at the job site during the pre-roofing conference.

1.7 SUBMITTALS

- A. Prior to starting work, the roofing contractor must submit the following:
 - 1. Shop drawings showing layout, details of construction and identification of materials.
 - 2. A sample of the manufacturer's Membrane System Warranty.
 - 3. Submit a letter of certification from the manufacturer which certifies the roofing contractor is authorized to install the manufacturer's roofing system and lists foremen who have received training from the manufacturer along with the dates training was received.
 - 4. Certification from the membrane manufacturer indicating the membrane thickness over the reinforcing scrim (top ply membrane thickness) is nominal .015-mil or thicker.
 - 5. Certification of the manufacturer's warranty reserve.
- B. Upon completion of the installed work, submit copies of the manufacturer's final inspection to the specifier prior to the issuance of the manufacturer's warranty.

1.8 CLEAN UP

- A. Roofing contractor shall exercise care to prevent scattering of debris during roofing operations. Paper wrappers, scrap felt, empty cartons, etc., shall be weighted to prevent blowing.
- B. No burning of debris will be permitted on the job site. Remove such debris from the site and haul to the public landfill area in compliance with applicable state, federal, and municipal laws.
- C. Measures shall be taken to protect adjacent areas and surfaces from being stained by over applying of adhesives.

1.9 WARRANTY

- A. Provide manufacturer's 20 year Total System Warranty covering both labor and material with no dollar limitation. The maximum wind speed coverage shall be peak gusts of 80 mph measured at 10 meters above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
- B. Warranty shall also cover leaks caused by accidental punctures:
 - 1. 20 man-hours per year for 115-mil FleeceBACK
 - 2. An additional 4 man-hours per year for the installation of Flexible FAST.
- C. Warranty shall also cover leaks caused by hail:
 - 1. 3" diameter hail when 115-mil FleeceBACK installed
- D. A Reflectivity Warranty Amendment indicating the membrane will meet the Energy Star program reflectivity guidelines for both new and aged membrane for a period of 10 years.

- E. Pro-rated System Warranties shall not be accepted.
- F. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

1.10 CLIMATIC CONDITIONS

- A. When weather reports indicate that the job site is within an area forecast to have greater than a 30% chance of rain, there is not to be any roof work performed.
- B. Air temperature is to be at least 40 degrees F and rising. Do not perform roof-related work when air temperature is below 40 degrees F.
- C. Do not allow site storage temperature to exceed 90 degrees F, provide shade over storage area.
- D. Liquid adhesives and sealants shall be maintained at 60 degrees F.

PART 2 PRODUCTS

2.1 GENERAL

- A. All components of the specified roofing system shall be products of Carlisle SynTec or accepted by Carlisle SynTec as compatible.
- B. Unless otherwise approved by the specifier and accepted by the membrane manufacturer, all products (including adhesives, insulation, fasteners, fastening plates and edgings) must be manufactured and supplied by the roofing system manufacturer and covered by the warranty.

2.2 MEMBRANE

- A. Furnish Sure-Weld white FleeceBACK 115-mil reinforced TPO (Thermoplastic Polyolefin) membrane. Membrane thickness over the reinforcing scrim (top-ply thickness) shall be nominal .015-mil or thicker.
- B. Membrane Color: White top surface with SRI (solar reflectance index) not less than 110, tested in accordance with ASTM E 1980.

2.1

- C. Membrane color at back sides of parapets to be gray.
- D. Membrane Weathering Performance: The TPO membrane shall be formulated with OCTAGUARD XT Weathering Package to withstand 60 days of exposure at a 275° F temperature and a minimum of 17,000 kj/m xenon arc resistance at 80°F without cracking or showing signs of material failure, exceeding ASTM 6878.

2.3 INSULATION/UNDERLAYMENT

- 1. When applicable, insulation shall be installed in multiple layers and secured with Carlisle FAST Adhesive to the substrate in accordance with manufacturer's published specifications.
 - a. **5/8" Securock Cover Board** – A uniform composition of fiber-reinforced with no facer for use as a cover board or a thermal barrier.

2.4 ADHESIVES, CLEANERS AND SEALANTS

All products shall be furnished by Carlisle and specifically formulated for the intended purpose.

- A. Flexible FAST Adhesive: An elongating impact resistant two component insulating urethane adhesive used to attach insulation and FleeceBACK membrane. Packaging formats include 50 and 15 gallon drums.
 1. Adhesive to provide 150% elongation in conjunction with fleece backed membrane – ASTM D412
 2. MDI content of Part A material less than 25%
- B. Sure-Weld Bonding Adhesive: A high-strength, synthetic rubber adhesive used for bonding Sure-Weld membrane to various surfaces. The adhesive is applied to both the membrane and the substrate at a coverage rate of approximately 60 square feet per gallon per finished surface (includes coverage on both surfaces). WALLS ONLY
- C. Cut-Edge Sealant: A white or clear colored sealant used to seal cut edges of reinforced Sure-Weld membrane. A coverage rate of approximately 225 - 275 linear feet per squeeze bottle can be achieved when a 1/8" diameter bead is applied.
- D. Water Cut-Off Mastic: Used as a mastic to prevent moisture migration at drains, compression terminations and beneath conventional metal edging (at a coverage rate of approximately 10' per tube or 100' per gallon).
- E. Universal Single-Ply Sealant: A 100% solids, solvent free, voc free, one part polyether sealant that provides a weather tight seal to a variety of building materials. It is white in color and is used for general caulking such as above termination bars and metal counter flashings and at scuppers.
- F. Thermoplastic One-Part Pourable Sealer: A one-part, moisture curing, elastomeric polyether sealant used to fill TPO Molded Pourable Sealant Pockets. Packaged in 4, 2-liter foil pouches inside a reusable plastic bucket. 1 pouch will fill 2 TPO Molded Pourable Sealant Pockets.
- G. Weathered Membrane Cleaner: Used to prepare membrane for heat welding that has been exposed to the elements or to remove general construction dirt at an approximate coverage rate of 400 square feet per gallon (one surface).
- H. TPO Primer: A solvent-based primer used to prepare the surface of Sure-Weld Membrane prior to application of Pressure-Sensitive Coverstrip and TPO Pressure-Sensitive RUSS.
- I. Cav-Grip Primer: a low VOC contact adhesive used to prime surfaces for the application of 725TR. (If unaged Asphalt is present Gav Grip primer is required.)

2.5 METAL EDGING AND MEMBRANE TERMINATIONS

- A. Where metal counterflashing are required, use 24 gauge galvanized sheetmetal unless noted otherwise on plans. Use similar material for miscellaneous metal flashings required throughout the project.
- B. Sheetmetal for fascia, gravel guard, rain diverters, and exposed metal covers shall be 24 gauge pre-finished metal unless noted otherwise on plans.
- C. Physical characteristics shall include 55 minimum lbf tearing strength, -40 F brittleness point, 1.0% maximum shrinkage after aging, and at least 120 minimum lbf puncture resistance.

2.6 WALKWAYS

- A. Protective surfacing for roof traffic shall be Sure-Weld TPO Walkway Rolls installed per manufacturer's requirements

2.7 EXECUTION

PART 3 GENERAL

- A. Comply with the manufacturer's published instructions for the installation of the membrane roofing system including proper substrate preparation, job site considerations and weather restrictions.
- B. Position sheets to accommodate contours of the roof deck and shingle splices to avoid bucking water.

3.1 SECUREROCK PLACEMENT

- A. Secure cover board to roof deck with Flexible FAST adhesive at 4" OC.

3.2 MEMBRANE PLACEMENT AND BONDING

- A. Position and unroll successive sheets and align to provide a minimum 2 inch overlap (use pre-marked overlap line) along the selvage edge. At end laps (along the width of the sheet), membrane shall be butted together which will be overlaid with 6 inch wide Sure-Weld Reinforced Membrane and hot air welded on all edges.
- B. Fleece-BACK Membrane shall be fully adhered to an acceptable substrate with Carlisle Flexible FAST Adhesive. The adhesive is spray applied or extruded to the substrate only and the membrane is rolled into the wet adhesive once it has foamed up and reached string/gel time (approximately 2 minutes). Roll the membrane with a weighted (100 - 150 pounds) steel roller to set the membrane into the adhesive.

Note: Exercise care to prevent overspray onto the membrane. If FAST Adhesive should contaminate the splice area, immediately (while the adhesive is still in liquid form) clean with Weathered Membrane Cleaner or allow FAST Adhesive to cure and remove with a paint-type scraper.

- C. Position adjoining sheets to allow a minimum overlap of 2 inches to provide a minimum 1-1/2" hot air weld.
- D. Continue to install adjoining membrane sheets in the same manner, overlapping edges a minimum of 2 inches and complete the bonding procedures as stated previously.

3.3 MEMBRANE HOT AIR WELDING PROCEDURES

- A. General The FleeceBACK membrane has a selvage edge (the fleece-backing is discontinued) along the length of the sheet for membrane splicing. Selvage edges are not provided along the width of the membrane; adjoining membrane sheets must be butted together and overlaid with 6 inch wide Sure-Weld Reinforced membrane heat welded on all sides.
- B. Hot Air Welding Procedures
 - 1. Hot air weld the Sure-Weld FleeceBACK membrane using an Automatic Hot Air Welding Machine or Hot Air Hand Welder in accordance with the manufacturer's specifications. At all splice intersections, roll the seam with a silicone roller to ensure a continuous hot air welded seam.

Note: When using 115-mil thick or thicker membrane, all splice intersections shall be

overlaid with Sure-Weld T-Joint covers or non-reinforced flashing

2. Probe all seams once the hot air welds have thoroughly cooled (approximately 30 minutes).
3. Repair all seam deficiencies the same day they are discovered.
4. Apply Cut Edge Sealant on all cut edges of reinforced membrane (where the scrim reinforcement is exposed) after seam probing is complete. Cut Edge Sealant is not required on vertical splices.

3.4 FLASHING

- B. Flashing of parapets, curbs, expansion joints and other parts of the roof must be performed using Sure-Weld FleeceBACK membrane or Sure-Weld reinforced membrane. Sure-Weld non-reinforced membrane can be used for flashing pipe penetrations, Sealant Pockets, and scuppers, as well as inside and outside corners, when the use of pre-molded accessories is not feasible.
- C. Follow manufacturer's typical flashing procedures for all wall, curb, and penetration flashing including metal edging/coping and roof drain applications.

3.5 WALKWAYS

- A. Install walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the specifier's drawing.
- B. Hot air weld walkway pads to the membrane in accordance with the manufacturer's specifications.

3.6 DAILY SEAL

- A. On phased roofing, when the completion of flashings and terminations is not achieved by the end of the work day, a daily seal must be performed to temporarily close the membrane to prevent water infiltration.
- B. Use FAST Adhesive or other similar material in accordance with the manufacturer's requirements.

3.7 CLEAN UP

- A. Perform daily clean up to collect all wrappings, empty containers, paper, and other debris from the project site. Upon completion, all debris must be disposed of in a legally acceptable manner.
- B. Prior to the manufacturer's inspection for warranty, the applicator must perform a pre-inspection to review all work and to verify all flashing has been completed as well as the application of all caulking.
- C. Remove all roof mastic from adjacent surfaces of roof-mounted equipment or accessories.
- D. Remove all excess materials from the roof when work is complete.
- E. Clean all debris from roof drains or gutters.
- F. Remove stains from white roof membrane.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Manufactured reglets with counterflashing.
 2. Formed roof-drainage sheet metal fabrications.
 3. Formed low-slope roof sheet metal fabrications.
 4. Formed steep-slope roof sheet metal fabrications.
 5. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each of the following
1. Underlayment materials.
 2. Elastomeric sealant.
 3. Butyl sealant.
 4. Epoxy seam sealer.
- B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 6. Include details of termination points and assemblies.
 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved.
- B. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop is to be listed as able to fabricate required details as tested and approved.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

- B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.3 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item] unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - d. Retain applicable fastener subparagraph(s) below.
 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- E. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- F. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- G. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 1. Material: Aluminum, 0.024 inch (0.61 mm) thick.

2.4 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

- B. Fabrication Tolerances:
 1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 1. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- G. Seams:
 1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters:
 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
 2. Fabricate in minimum 96-inch- (2400-mm-) long sections.
 3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
 4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
 5. Accessories: Wire-ball downspout strainer.
 6. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
 - a. Aluminum: 0.032 inch (0.81 mm) thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
 1. Fabricate from the following materials:
 - a. Aluminum: 0.024 inch (0.61 mm) thick.

2.6 INSTALLATION OF UNDERLAYMENT

2.7 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder welds sealant.
 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.

4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
 6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

2.8 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
1. Join sections with riveted and soldered joints.
 2. Provide for thermal expansion.
 3. Attach gutters at eave or fascia to firmly anchor them in position.
 4. Provide end closures and seal watertight with sealant.
 5. Slope to downspouts.
 6. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, as indicated on the drawings. Install expansion-joint caps.
 7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.
- C. Downspouts:

1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.

Retain one of two subparagraphs below; delete both if indicated on Drawings.

4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

Retain "Splash Pans" Paragraph below for metal splash pans.

2.9 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

2.10 INSTALLATION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

2.11 CLEANING

- A. Clean and neutralize flux materials. Clean off excess solder.
- B. Clean off excess sealants.

2.12 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 62 00

SECTION 07 92 00

JOINT SEALERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work in this Section.

1.2 WORK INCLUDED

- A. Provide caulking in conjunction with interior painting operations and as otherwise indicated on drawings for interior caulking.
- B. Perform all work required to complete the joint preparation, joint packing or filler, priming, caulking and sealing indicated by the drawings and specified herein. Furnish all supplementary items necessary.
- C. In fire rated partitions, install only fire resistant sealants.

1.3 RELATED SECTIONS

- A. Section 08100 - Hollow Metal Frames.
- B. Section 08410 – Aluminum Entrances and Storefronts
- C. Section 09900 - Painting.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications:
 - 1. Minimum two year's experience in applying sealants and approved by manufacturer.
- B. Manufacturer's Representative:
 - 1. Arrange for technical representative to be on project site to advise installer of proper procedures and precautions for use of materials and to check installation.

1.5 REFERENCE STANDARDS

- A. FS TT-S-00230C, Type II Sealing Compound: Elastomeric Type, Single Component.
- B. FS TT-S-001543A Sealing compound: Silicone Rubber Base.
- C. FS TT-S-00227E, Type I, Class A Joint Sealant: Self Levelling.
- D. ASTM C834 Standard Specification for latex sealing compounds.

1.6 SUBMITTALS

- A. Submit the following:
 - 1. Product Data:
 - a. Manufacturer's specifications, recommendations and installation instructions for sealant, backing, and related materials.
 - 2. Samples:
 - a. Color charts for selection by architect.
 - b. Furnish samples of custom colors.
 - 3. Certification:
 - a. Letter of certification from manufacturer or certified test laboratory report that materials are chemically compatible with each other and with substrate.
 - b. Letter from manufacture that certifies material's fire resistant qualities.
 - c. When requested by the architect, submit samples of cured sealants and a 6 inch long sample of each type of joint backup.

1.7 DELIVERY AND STORAGE

- A. Deliver materials in unopened containers as packaged by the manufacturer. Store in a manner to protect materials from the weather.

1.8 WARRANTY

- A. Warranty, in writing, materials and workmanship against air and water leakage for a five-year period.
- B. Provide written warranty of materials fire resistance and accepted use in at least a one hour fire resistant assembly.

PART 2 PRODUCTS

2.1 PRODUCTS

- A. Pecora Chemical corporation.
- B. Sonneborn Building Products.
- C. W.R. Grace and Company.
- D. General Electric Company.
- E. Products Research and Chemical Corporation.
- F. Substitutions: In accordance with Section 01600.

2.2 MATERIALS

- A. Polysulfide (Type I):
 - 1. Two-part conforming to FS TT-S-00227E, Class A, Type I (self-leveling) or Type 2 (nonsag) as recommended by manufacturer.
 - 2. Color: As selected by architect.

3. Acceptable products:
 - a. Synthacalk GC-5, Pecora Corp.
 - b. 350, PRC.
 - c. Sonolastic, Sonneborn-Contech, Inc.
- B. Chlorosulfonated Polyurethane (Type 2)
1. One part conforming to FS TT-S-230C.
 2. As selected by architect.
 3. Acceptable products:
 - a. Synthacalk, Pecora.
- C. Polyurethane (Type 3):
1. Two-part conforming to FS TT-S-0000227E, Class A, Type I or II.
 2. Color: As selected by architect.
 3. Acceptable products:
 - a. NR-200, Pecora.
 - b. No. 200, PRC.
 - c. Sonolastic Paving Joint Sealant, Sonneborn-Contech.
 - d. THC-900/901, Tremco.
- D. Polyurethane (Type 4):
1. One-part conforming to FS TT-S-000230C, Class A, Type II.
 2. Color: Custom color as selected by architect.
 3. Acceptable products:
 - a. No. 6000, PRC.
 - b. NP 1, Sonneborn - Contech.
 - c. Dymonic, Tremco.
- E. Silicone (Type 5):
1. One part rubber based silicone conforming to FS TT-S-001543, Class A, Type I.
 2. Color: Custom color as selected by architect.
 3. Acceptable products:
 - a. 790 Building Sealant, Dow Corning.
 - b. Silproof, General Electric.
 - c. Proglaze, Tremco.
- F. Acrylic, Solvent Cure (Type 6):
1. One-part, FS TT-S-00230.
 2. Acceptable products:
 - a. Unicylic, Pecora.
 - b. Permacryl, Schnee-Moorhead Chemicals, Inc.
 - c. Mono, Tremco Manufacturing Company.
- G. Nondrying, Nonskinning (Type 7):
1. One-part sealing compound.
 2. Acceptable products:
 - a. GC-55, Noncuring, Goal Chemical.
 - b. BR-96, Pecora.
 - c. Curtain Wall Sealant, Tremco.
- H. Bitumen Impregnated Sealant (Type 8):
1. Precompressed bitumen impregnated foam joint sealant.
 2. Size: As recommended by manufacturer for joint condition as rain seal.
 3. Acceptable product: Emseal compressed, Emseal Corporation.

- I. Backer Rod: Closed cell expanded polyurethane or polyethylene "Denver" foam, compatible with sealant; sized and shaped to control depth of sealant; and to maintain 20% to 50% compression of material.
- J. Joint Cleaners and Primers: As recommended by sealant manufacturer.
- K. Bond Breaker: Pressure sensitive adhesive polyethylene tape.
- L. Masking Tape: Pressure sensitive adhesive paper tape.
- M. Sealant Tape:
 - 1. Compressible adhesive-cohesive tape of cross-linked butyl polyisobutylene rubber that accommodates variations and movement, sized as necessary to allow for joint movement of + or - 25%.
 - 2. Acceptable product: PTI 606, Protective Treatments, Inc.
- N. Expansion Joint Filler:
 - 1. Closed cell polyethylene compatible with sealant.
 - 2. Acceptable product: Sonoflex F, Sonneborn.
 - 3. Fire resistant to be used in at least a one hour fire rating classification.

2.3 MIXING

- A. Mix components in accordance with manufacturer's recommendations.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine all surfaces to receive sealant and report all conditions not acceptable. Installation shall be deemed as acceptance of the surface.

3.2 PREPARATION

- A. Clean all surfaces and joints thoroughly, removing all foreign matter, dust, oil, grease, water surface, dirt, frost, old caulking material, and previously applied paint or primer.
- B. Prime and prepare surfaces in strict accordance with sealant or caulk manufacturer's written instructions and recommendations.
- C. Remove loose mill scale from steel surfaces. Remove dirt, oil, or grease by solvent cleaning and wipe surfaces. All surfaces must be clean and dry. Any protective coating on building materials that will impair sealant bond shall be removed.

3.3 APPLICATION

- A. Sealants:
 - 1. Follow sealant manufacturer's instructions regarding preparation, priming, application life, and application procedure.
 - 2. Apply masking tape where required in continuous strips in alignment with joint edge. Remove tape immediately after joints have been sealed and tooled as directed.
 - 3. Apply sealant under pressure with gun having nozzle of proper size or other appropriate means. Provide sufficient pressure to completely fill joints.
 - 4. Neatly point or tool sealant to provide proper contour. Use clean water-wet tool or tooling solution recommended by manufacturer when tooling white or light colored sealant.

- B. Caulking:
 - 1. Caulking: Apply caulking joints before final coat of paint is applied to adjacent surface. Apply caulking with a pressure gun having a nozzle of proper size to fit joint. Completely fill joint and firmly tool against backing to make a smooth, convex bed, and assure good adhesion. Caulking shall develop a firm skin before paint is allowed.
- C. Joint Size:
 - 1. Sealant and Caulking: Depth equal to 1/3 times joint width or as recommended by manufacturer.

3.4 CLEANING

- A. Remove excess caulking or sealant materials and smears from adjacent surfaces as work progresses.
- B. On non-porous surfaces excess uncured sealant shall be removed with a solvent moistened cloth immediately. On porous surfaces excess sealant should be allowed to cure overnight, then removed by lightly wirebrushing or sanding. All adjacent surfaces shall be clean and free from stains.
- C. Remove all debris resulting from these operations from the site.

3.5 SCHEDULE

- A. Interior and Exterior Joints Subject to Movement (Not Including Traffic): Type 1, 2, 4, or 5 at Contractor's option and as recommended by manufacturer for joint condition and sealant color.
- B. Interior and Exterior Horizontal Joints Subject to foot and Vehicular Traffic: Type 2, self-leveling.
- C. Interior Horizontal and Vertical Joint Not Subject to Movement (Not Including Traffic): Type 6.
- D. In contact with roofing and waterproofing materials: Type 3 or 4, low modulus, unmodified.
- E. Unexposed window joints: Type 7.
- F. Interior fire resistant rating of at least a one hour rated assembly subjected to minimal movement: Type 2.
- G. Secondary seal and exterior brick expansion joint secondary seals: Type 8.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work in this Section.

1.2 WORK INCLUDED

- A. Custom fabricated rated and non-rated steel frames.

1.3 RELATED SECTIONS

- A. Section 08111 - Steel Doors.
- B. Section 08700 - Finish Hardware
- C. Section 08213 – Plastic Laminate Clad Doors
- D. Section 09900 - Painting.

1.4 REFERENCES

- A. ASTM A569 - Steel, Carbon, Hot-Rolled Sheet and Strip, Commercial Quality.
- B. ASTM A591 - Steel Sheet, Cold-Rolled, Electrolytic Zinc Coated.
- C. NFPA 80 - Fire Doors and Windows.
- D. NFPA 252 - Fire Tests for Door Assemblies.
- E. SDI - 100 - Standard Steel Doors and Frames.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of SDI - 100.
- B. Fire rated frame construction to conform to NFPA 252.
- C. Installed door and frame assembly to conform to NFPA 80 for fire rated class indicated on drawings.

1.6 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate frame configuration, anchor spacings, anchor types, and location of cutouts for hardware and reinforcement.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Protect products under provisions of Section 01600.
- B. Protect frames with resilient packaging.

1.8 WARRANTY

- A. Provide five year manufacturer's warranty under provisions of Section 01700.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Republic Builders Products Corp./ Subs. Republic Steel
- B. Ceco Corporation
- C. Tex-Steel Corporation
- D. Substitutions: Under provisions of Section 01600.

2.2 FRAMES

- A. Material: ASTM A569, hot rolled carbon steel.
- B. Frame Gage: 16 gage for interior frames, 14 gage for exterior frames.
- C. Hardware Reinforcement: SDI - 107.
- D. Dimensions: 1 inch return by required wall thickness; all frames are to match.

2.3 ACCESSORIES

- A. Jamb Anchors: 'Z' type for metal studs.
- B. Silencers: As specified in Section 08700. Exterior door frames are not to have silencers.

2.4 FABRICATION

- A. Fabricate frames and assemble as a complete welded unit. Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible. No joint shall be obvious between head and jambs.
- B. Fabricate frames with hardware reinforcement plates welded in place. Comply with ANSI A115 "Specifications for Door and Frame preparation for Hardware".
- C. Prepare frames for silencers. Provide three single silencers for single interior doors on strike side. Exterior frames are not to have silencers.
- D. Fabricate jamb anchors to be set in metal stud partitions from minimum 16 gage cold rolled steel complying with ASTM A526.
- E. Shop paint surfaces of doors and frame units, including galvanized surfaces, using manufacturer's standard baked-on rust-inhibitive primer.

- F. Provide 26 gage steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster opening.

2.5 FINISH

- A. Primer: Baked on.
- B. Paint: As specified in Section 09900.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install frames in accordance with SDI - 100.
- B. Coordinate with gypsum wallboard wall construction for anchor placement.
- C. Install minimum of 4 anchors per jamb for frames set in metal stud framing.

3.2 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.3 ADJUSTING AND CLEANING

- A. Adjust for smooth and balanced door movement.
- B. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up paint of compatible air-drying primer.

END OF SECTION

SECTION 08 11 16

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.
 - 1. Types of Kawneer Aluminum Storefront Systems include:
 - a. Trifab® 400 Storefront System - 1-3/4" x 4-1/2" nominal dimension; Center, Weatherseal Glazed, Stick Fabrication – Interior System.
 - b. Trifab® 451 Storefront System - 1-3/4" x 4-1/2" - Exterior System.
 - c. 500 Wide Stile Entrances
- C. Related Sections:
 - 1. Section 08800 Glazing
 - 2. Section 07900 Joint Sealers
 - 3. Section 08710 Hardware Schedule

1.2 SYSTEM DESCRIPTION

- A. Storefront System Performance Requirements:
 - 1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures as required in the the International Building Code; 2006 Edition.
 - 2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft² at a static air pressure differential of 6.24 psf.
 - 3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf as defined in AAMA 501.
 - 4. Uniform Load: A static air design load of 20 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

1.3 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in “Conditions of the Contract.”
- B. Quality Assurance/Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.4 WARRANTY

- A. Project Warranty: Refer to “Conditions of the Contract” for project warranty provisions.
- B. Manufacturer’s Product Warranty: Submit, for Owner’s acceptance, manufacturer’s warranty for entrance system as follows:
 - 1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by Kawneer. In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representation during construction.
 - 3. On access control installations, all wiring to be coordinated with a licensed electrical installer.
- B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead- time requirements to avoid construction delays.
- B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle entrance doors and components to avoid damage. Protect entrance doors against damage from elements, construction activities, and other hazards before, during and after entrance installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

- A. Acceptable Manufacturers:
 - 1. Address: Kawneer Company, Inc
555 Guthridge Court,
Technology Park/Atlanta,
Norcross, GA 30092
Telephone: 770 449 5555
Fax: 770 734 1560
 - 2. Proprietary Product(s)/System(s): Kawneer Aluminum Entrances.
 - a. Kawneer Aluminum Storefront System.
Series: Trifab® 451 Storefront System.
 - d. Framing Member Profile: 1-3/4" x 4-1/2" (44.5 x 114.3) nominal dimension; Non-Thermal; Center, Screw Spline, Shear Block, Stick or Punched Opening Fabrication.
 - e. Finish/Color: Clear Anodized Aluminum
- B. Substitutions:
 - 1. General: Refer to Substitutions Section for procedures and submission requirements.
 - a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
 - b. Post-Contract (Construction Period) Substitutions: Submit written request in order to avoid entrance door installation and construction delays.
 - 2. Substitution Documentation:
 - a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
 - b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for entrance door system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum entrance doors for a period of not less than ten (10) years. (Company Name)
 - c. Test Reports: Submit test reports verifying compliance with each test requirement for entrance door configurations required by the project.
 - d. Product Sample and Finish: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.
 - 3. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 MATERIALS

- A. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
- B. Thermal separators for door cladding shall be rigid polyvinylchloride (PVC) extrusions and VHB acrylic foam tape.
- C. Provide adjustable glass jacks to help center the glass in the door opening.

2.3 ACCESSORIES

- A. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.
- B. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4 RELATED MATERIALS

- A. Sealants: Refer to Joint Treatment (Sealants) Section
- B. Glass: Refer to Glass and Glazing Section

2.5 FABRICATION

- A. Entrance System Fabrication:
 1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" (28.6) long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
 2. Exposed portions of door cladding moldings shall be 3/32" (2.4) thick.
 3. Aluminum cladding shall be interlocked with PVC separators and applied with VHB acrylic foam tape. There shall be no metal to metal contact, direct or indirect, between the cladding or the cladding attachments and the door structure.
 4. Accurately fit and secure joints and corners. Make joints hairline in appearance.
 5. Prepare components with internal reinforcement for door hardware.
 6. Arrange fasteners and attachments to conceal from view.
- B. General framing system:
 1. Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
 2. Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
 3. Prepare components to receive anchor devices. Fabricate anchors.
 4. Arrange fasteners and attachments to conceal from view.

2.6 FINISHES

- A. Factory Finishing:
 1. Clear anodized aluminum.
- B. Face Sheets:
 1. Aluminum with finish options above.

2.7 SOURCE QUALITY CONTROL

- A. Source Quality: Provide aluminum entrances specified herein from a single source.
 1. Building Enclosure System: When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

- B. Fabrication Tolerances: Fabricate aluminum entrances in accordance with entrance manufacturer's prescribed tolerances.

2.8 HARDWARE

- A. General: Provide manufacturer's standard hardware or those listed below, fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely aluminum-framed entrance doors. Coordinate hardware requirements with hardware specification and ensure that all items are covered.

- 1. Standard Hardware:

- a. Weatherstripping
- b. Sill Sweep Strips

- 2. Optional Hardware - refer to Door Schedule

Pairs to receive

Single to receive

1 EA	Continuous Hinge	MCK-12HD
2 EA	Exit Devices	Sergeant 8504 862
1 EA	Cylinder	Best 1E72
2 EA	Closer	351-PSH-350D
1 EA	Threshold	170A

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive entrance system and sill plate is level in accordance with manufacturer's acceptable tolerances.
 - 1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION

- A. General: Install storefront system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.
 - 1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
 - 2. Weather Tight Construction: Install sill members and other members in a bed of sealant or with joint filler or gaskets, to provide weather tight construction. Coordinate installation with wall flashings and other components of construction.
 - 3. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- A. General: Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.
 - 1. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
 - 2. Provide alignment attachments and shims to permanently fasten system to building structure.
 - 3. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.
 - 4. Set thresholds in bed of mastic and secure.
 - 5. Adjusting: Adjust operating hardware for smooth operation.
- B. Related Products Installation Requirements:
 - 1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section.
 - 2. Glass: Refer to Glass and Glazing Section.

- a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.3 CLEANING AND PROTECTION

- A. **Cleaning:** Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- A. **Protection:** Protect installed product's finish surfaces from damage during construction. Protect aluminum entrances from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum entrances at no extra cost.

END OF SECTION

SECTION 08 13 13

STEEL DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. The extent of hollow metal doors and frames is shown on the drawings and schedules; all shall be custom hollow metal work.

1.3 RELATED SECTIONS

- A. Section 01090 - Reference Standards.
- B. Section 01700 - Contract Closeout.
- C. Section 07900 - Joint Sealers.
- D. Section 08100 - Hollow Metal Frames.
- E. Section 08700 - Finish Hardware.
- F. Section 09900 - Painting.

1.4 QUALITY ASSURANCE

- A. Provide hollow metal doors and frames manufactured by a single firm specializing in the production of this type of work.

1.5 REFERENCE STANDARDS

- A. In addition to other specified requirements, comply with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI-100), for the following classifications:
 - 1. Exterior Doors: SDI-100, Grade III, extra heavy-duty, Model 2, Minimum 16-gage faces.
 - 2. Doors of this project shall meet exterior standards, but used at interior locations.
- B. Comply with latest adopted version of the Texas Accessibility Standards and Americans with Disabilities Act.

1.6 SUBMITTALS

- A. With manufacturer's standard details and specifications for steel doors and frames, submit shop drawings showing application to project, as required.
- B. Provide a written warranty letter per Section 01700, 1.8, on business letterhead stating that installed door components comply with TAS and/or ADA.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. Hollow Metal:
 - 1. Steelcraft/Div. American Standard Co.
 - 2. Republic Builders Products Corp./Subs. Republic Steel.
 - 3. Tex-Steel Corporation.
 - 4. Hol-O-Met, Inc.
 - 5. Superior Door and Sash Company.
 - 6. Substitutions: In accordance with Section 01600.

2.2 MATERIALS

- A. Metal steel doors and frames; hot-rolled, pickled and oiled per ASTM A 569 and A 568; cold-rolled per ASTM A 366 and A 568.
- B. All Doors: SDI-100, Grade III, extra-heavy duty, Model 2, Minimum 16-gauge faces.
- C. Anchors and Accessories: Manufacturer's standard units. Use galvanized items for units built into exterior walls, complying with ASTM A 153.

2.3 FABRICATION

- A. Fabricate units to be rigid, neat in appearance, and free from defects, warp or buckle. Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible.
- B. Prepare steel doors and frames to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping, complying with ANSI A 115 "Specifications for Door and Frame Preparation for Hardware".
- C. Reinforce units to receive surface-applied finish hardware to be field applied.
- D. Locate finish hardware as indicated or, if not indicated, per DHI "Recommended Locations for Builder's Hardware".
- E. Shop paint surfaces of doors and frame units, including galvanized surfaces, using manufacturer's standard baked-on rust-inhibitive primer.
- F. Doors: Comply with SDI-100, of the types and styles indicated, for materials quality, metal gages, and construction details.
- G. Frames: Comply with SDI-100, of the types and styles indicated, for materials quality, metal gages, and construction details.
- H. Provide standard hollow metal frames for doors, transoms, sidelights, borrowed lights, and other openings as indicated. Frames 6 feet wide and under shall be constructed of 16 gage material.
- I. Prepare frames to receive 3 silencers on strike jambs of single-swing frames and 2 silencers of double-swing frames.
- J. Provide 26 gage steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster openings.
- K. Protect inside faces of frames in plaster or masonry wall construction which are placed with anti-freeze additives, using high-build fibered asphalt emulsion coating.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install hollow-metal units in accordance with manufacturer's instructions and final shop drawings. Fit doors to frames and floors with clearances specified in SDI-100.
- B. Finish hardware is specified in Section 08700.

3.2 ADJUST AND CLEANING

- A. Prime coat touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up paint of compatible air-frying primer.
- B. Final adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION

SECTION 08 14 29
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 083473.16 "Wood Sound Control Door Assemblies" for acoustic flush wood doors.
2. Section 088000 "Glazing" for glass view panels in flush wood doors.
3. Section 134900 "Radiation Protection" for lead-lined flush wood doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples: For factory-finished doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. ABS- American Building Supply- Doormerica.

2. Marshfield DoorSystems, Inc.
3. VT Industries Inc.

2.2 FLUSH WOOD DOORS, GENERAL

A. WDMA I.S.1-A Performance Grade:

1. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits.
2. Standard Duty: Closets (not including janitor's closets) private toilets.

B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.

1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors :

1. Grade: Premium, with Grade AA faces.
2. Species: Select white birch.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core: Particleboard.
8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
9. Construction: Seven plies, either bonded or nonbonded construction.

2.4 LIGHT FRAMES AND LOUVERS

- ### A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

1. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.
3. Factory machine doors for hardware that is not surface applied.
4. Openings: Factory cut and trim openings through doors.
5. Light Openings: Trim openings with moldings of material and profile indicated.
6. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
7. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
- B. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- C. Factory finish doors that are indicated to receive transparent finish.
- E. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Transparent Finish:
 1. Grade: Premium.
 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Open-grain finish.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 08710 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

- D. Install fire-rated doors according to NFPA 80.

- F. Install smoke- and draft-control doors according to NFPA 105.

- H. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

- I. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

- K. Comply with NFPA 80 for fire-rated doors.

- L. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

- M. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 08210

SECTION 08 71 00

FINISH HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Complete sets of hardware for all new doors. New hardware shall be as manufactured SARGENT with style, type, finish, and installation heights as scheduled.
- B. Butts and hinges, locks and latch sets, closers, push/pulls, trim units, kick plates, silencers, and miscellaneous items required for a complete installation.
- C. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion. Any item of finish hardware not specifically mentioned, but which is necessary for proper completion of the work shown on the Drawings shall be provided without additional cost to owner. Any omissions shall be called to the attention of the Architect prior to bid opening; otherwise the Drawings and Specifications will be considered complete.
- D. All door hardware shall meet current Texas Accessibility Standards criteria.

1.3 RELATED SECTIONS

- A. Section 01090 - Reference Standards.
- B. Section 01700 - Contract Closeout.
- C. Section 06400 - Architectural Millwork.
- D. Section 08100 - Hollow Metal Frames.
- E. Section 08213 - Wood Doors.
- F. Section 08800 - Glazing.
- G. Section - Electrical

1.4 REFERENCES

- A. ADA - Americans with Disabilities Act, 36 CFR.

- B. ANSI/NFPA 80 - Fire Doors and Windows.
- C. AWI - Architectural Woodwork Institute.
- D. BHMA - Builders' Hardware Manufacturers Association.
- E. DHI - Door and Hardware Institute.
- F. NAAMM - National Association of Architectural Metal Manufacturers.
- G. NFPA 101 - Life Safety Code.
- H. SDI - Steel Door Institute
- I. ANSI A115.2 - Door and Frame Preparation for Bored or Cylindrical Locks for 1-3/4 inch Doors.
- J. ANSI A115.9 - Door and Frame Preparation for Closer, Offset Hung, Single Acting.
- K. ANSI A156.1 - Butts and Hinges.
- L. ANSI A156.2 - Locks and Lock Trim.
- M. ANSI A156.4 - Door Controls (Closers).
- N. ANSI A156.6 - Architectural Door Trim.
- O. ANSI A156.7 - Template Hinges.

1.5 COORDINATION

- A. Coordinate work of this section with other sections involving manufacturer of any internal reinforcement for door hardware.
- B. Hardware subcontractor shall examine the drawings and specifications to determine the extent of hardware quantities required. Should any particular door or item be omitted in any scheduled hardware group, provide such door or item with hardware similar to that required for similar conditions on the project. Locks, bolts, hinges, pulls, levers shown on the plans for non-factory manufactured cabinet and casework shall be included in the Division of Finish Hardware.
- C. When new hardware is to match an existing owner's standard, new shall match in every way so long as it does not violate Texas Accessibility Standards criteria. New door hardware shall comply with T.A.S. Contractor shall confirm what is owner's standard prior to ordering material.

1.6 QUALITY ASSURANCE

- A. Manufacturers: Companies specializing in manufacturing door hardware with minimum three year's experience.
- B. Hardware Supplier: Company specializing in supplying commercial and institutional door hardware with five year's documented experience.
- C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of the section.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for requirements applicable to fire rated doors and frames.
- B. Conform to the applicable sections of Chapter 5 of NFPA 101.
- C. Conform to criteria stated in the most current edition of the Texas Accessibility Standards.

1.8 SUBMITTALS

- A. Submit schedule, shop drawings, and product data under provisions of Section 01300. Resubmittals will be required until complete architectural approval is obtained.
- B. Indicate location and mounting heights of each type of hardware. Show required mortising and internal reinforcing of metal products.
- C. Provide product data on specified hardware.
- D. Submit keying diagrams to show grandmaster, master, etc. level of hierarchy.
- E. Submit proposed replacement levers, finish, function, and example of new hardware that is replacing existing hardware.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01700.
- B. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- C. Lost or stolen hardware shall be the responsibility of the contractor. Replace all items lost or stolen with identical items at no cost to owner.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify package with door opening code to match hardware schedule.
- B. Protect hardware from theft by cataloging and storing in secure area.

1.11 MAINTENANCE MATERIALS

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

1.12 WARRANTY

- A. Provide a written warranty per Section 01700, 1.8, on business letterhead stating that installed door components comply with TAS and/or ADA.
- B. Provide warranties for all hardware furnished under this division to the general contractor for transmittal to the architect. Warranties shall be for a period of one (1) year (five [5] years for closer) from date of owner acceptance, against defects in material and workmanship of the merchandise.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Locksets and Latches: Sargent. No substitutions allowed.
- B. Hinges: Hager, McKinney.
- C. Closers: Sargent. No substitutions allowed.
- D. Exit Devices: Sargent. No substitutions allowed.
- E. Kickplates, stops, and silencers: Trimco, Rockwood. IPC, Pawling
- F. Smoke seals: Pemko, Zero,

2.2 STYLE

All hardware components shall match throughout the facility in finish, style, and function.

2.3 KEYING

- A. All cylinders are keyed to the existing key system
- B. Supply two keys for each lock.
- C. Coordinate keying of new cylinders with owner.

2.4 FINISHES

Finishes for new hardware are identified in the schedule at end of this section. Submit for architect's approval.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing conditions.
- C. The Owner reserves the right to request and pay for an inspection by a representative of the referenced organization to determine that the work of this Section has been performed in accordance with the specified requirements.
- D. In the event such inspection determines that the work of this Section does not comply with the specified requirements, immediately remove the non-complying items and immediately replace them with items complying with the specified requirements, all at no additional cost to the Owner, and reimburse the Owner for the cost of the inspection.

3.2 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and requirements of SDI, NAAMM, AWI, ANSI/NFPA 80, BHMA, DHI, and Texas Accessibility Standards.
- B. The contractor shall install all finished hardware plump, square, true and in accordance with the manufacturer's instructions, using the best practices as approved by architect. Hardware shall be fitted and operated prior to painting, then removed and painting completed before final installation. All hardware must be thoroughly cleaned, free from mars and blemishes and in perfect operating

condition when turned over to the owner. Damaged or malfunctioning hardware will not be acceptable.

- C. No extra costs will be allowed to facilitate proper installation of any hardware. The general contractor shall be responsible for the proper fabrication of all materials and work to receive hardware.
- D. Finish hardware shall be furnished with all necessary screws, bolts, or other fastenings of suitable size use and long life and shall harmonize with the hardware as to material and finish. These fastenings shall be furnished where necessary with expansion shield, security bolts, toggle bolts or other approved anchors according to the material to which it is applied and recommended by the manufacturer. All hardware fastened to concrete shall be furnished with machine screws and lead shields. Extension flushbolts shall be edge mounted in all cases. Wrought box strikes shall be furnished where strikes are mortised into wood. Strikes shall have sufficiently extended lips where required to protect trim from being marred by latch-bolts, but no more than necessary. Strikes for pairs of doors shall have 1" lips to center. All backsets of locks and latches shall be 2-3/4" from the door edge unless otherwise indicated.
- E. Hardware for fire doors shall conform to the requirements for NFPA 80 and NFPA 101. In case of conflict between the type of hardware specified in these specifications or the type required for fire protection, materials of equal quality and design required by NFPA, shall be furnished, at no additional cost to owner.

3.3 HANDICAP ACCESSIBILITY PROVISIONS

- A. Door Hardware: Handles, levers, pulls, latches, locks, and other operating devices on accessible doors shall be mounted no higher than 48 inches above the floor or ground surface and shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or severe twisting to operate. The force required to activate door hardware shall be no greater than five lbf. Designs include lever-operated mechanisms, push-type mechanisms and U-shaped handles. When sliding doors are fully open, operating hardware shall be exposed and usable from both sides. Doors to hazardous areas such as loading platforms, boiler rooms, mechanical and electrical rooms, and to other areas that might be dangerous to a blind person, shall be made identifiable to the touch by a textured surface on the door handle, lever, pull or other operating hardware. This textured surface maybe made by knurling or roughening or by a material applied to the contact surface. Such textured surfaces shall not be provided for emergency exit doors or any doors other than those to hazardous areas.
- B. Door Closer: If a door has a closer, then the sweep period of the closer shall be adjusted so that from an open position of 90 degrees to 12 degrees, the door will take at least five (5) seconds minimum. Fire doors are excluded from this requirement. Spring Hinges shall be adjusted to close from 70 degrees to closed position in 1.5 seconds minimum.
- C. Door Opening Force: The maximum force for pushing or pulling open a door shall comply with this paragraph. For hinged doors, the force shall be applied perpendicular to the door at the door opener or 30 inches from the hinged side, whichever is farther from the hinge. For sliding or folding doors, the force shall be applied parallel to the door at the door pull or latch.
 - 1. Exterior hinged doors shall not exceed 8.5 lbf. Slight increases in opening force shall be allowed where 8.5 lbf is insufficient to compensate for air pressure differentials.
 - 2. Sliding doors, folding doors, and interior hinged doors shall not require a force exceeding five lbf.
 - 3. Fire doors may be adjusted to meet the minimum opening force allowed by the governing authority or applicable building code.
- D. Thresholds: The height of any floor level change plus the height of any applied threshold at doorway sills shall no exceed 1/2" and shall be beveled with a slope no greater than 1" in 2".

- E. Conform to latest adopted version of the Americans with Disabilities Act and Texas Accessibility Standards criteria for positioning, operating, and opening force requirements. In case of conflict, materials of equal quality and design required by ADA or TAS shall be provided.

3.4 HARDWARE LOCATIONS

- A. Adjust any of the following heights, as required to maintain the existing standards established by the owner.
- B. Locks, latches: Finish floor to C/L of knobs, 41-13/16"
- C. Deadlocks: Finish floor to C/L of cylinder shall be as scheduled – not to exceed 48"
- D. Push/Pull Plates: Finish floor to C/L of plate shall be as scheduled, as scheduled
- E. Flushbolts: C/L of bolt face to top (and bottom) edge of floor, 12"
- F. Exit Devices: Per template and installation instructions; Rails shall not conflict with door lites, mounting heights shall be adjusted to center exit rail on appropriate door rail. Finish Floor to C/L of Pushrails shall be 38".
- G. Closer, O/H Holders: Per template and installation instructions.
- H. Stops: To protect doors and hardware from contact with parts of the building or other conflicting doors.
- I. Butt Hinges:
 - 1. Top anchor butt - per template instructions;
 - 2. Top butt hinge - top edge of butt leaf to rabbet, 5" minimum
 - 3. Bottom butt hinge - bottom edge of butt leaf to finish floor, 10" maximum
 - 4. Intermediate butt hinge - equal distant between top and bottom butts.

3.5 ADJUSTMENT AND MAINTENANCE

- A. Within thirty (30) days after Owner Acceptance of the Project, the subcontractor shall meet with the Owner's maintenance foreman and thoroughly instruct him in the care and adjustment of all movable hardware furnished under this division. Provide him with a Manufacturer's Parts List for all locks, exits and closer, a Bound Care and Adjustment Manual, and an adjustment tool for each type of adjustable hardware. Included shall be a copy of an approved Hardware Schedule.

3.6 HARDWARE SCHEDULE

Hardware Set 1.1

Doors: 100

Each to receive:

1	EA	Continuous Hinge	KCFM83-HD1 SER8	PE
1	EA	Rim Exit Device	55 56 8504 862 US32D	SA
1	EA	Mortise Cylinder	41 US32D	
1	EA	Surface Closer	LDP 351 CPS EN	SA
1	EA	Threshold	2005AV 36"	PE

READER & POWER SUPPLY BY SECURITY PROVIDER. BALANCE OF GASKETING BY DOOR SUPPLIER.

Hardware Set 2.1

Doors: 101, 121

Each to receive:

1	EA	Continuous Hinge	KCFM83-HD1 SER8	PE
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1	EA	Rim Exit Device	55 56 8504 862 US32D	SA
1	EA	Mortise Cylinder	41 US32D	
1	EA	Surface Closer	LDP 351 CPS EN	SA
1	EA	Threshold	2005AV 36"	PE

Hardware Set 3.1

Doors: 102, 121a

Each to Receive:

1	EA	Continuous Hinge	KCFM83-HD1 SER8	PE
1	EA	Storeroom/Closet	8204 LW1L US26D	SA
1	EA	Electric Strike	8000C....12/24VDC....non-rated cyl latches	630 Hes Inc
1	EA	EI Strike Accy	2005M3....smart pac III in-line power controller	Hes Inc
1	EA	Wall Stop	409 US32D	RO
1	EA	Surface Closer	LDP 351 CPS EN	SA
1	EA	Power Supply	BPS-24-1 {locate in easy access location}	Securitron

UNIT TO BE LOCATED AT RECEPTION DESK - SPN-5936 OPERATION: unit is a 3 gang wall plate consisting of 5 SPDT momentary green push buttons over 5 DPDT maintained green push buttons which light up. depressing one of the momentary push buttons will release electric strike at first electric door to allow momentary unlocking for ingress. depressing one of the maintained lighted push buttons will release electric strike at second electric door to allow maintained unlocking for ingress. this operation is identical for third and fourth doors. The fifth button is extra for future use. The maintained DPDT and the momentary SPDT will be wired in parallel to both electric strikes at the pair of doors it is dedicated to unlocking, thus allowing either pushbutton to control the electric strikes.

NOTE: the two wires for the lights draw 10 milliamps and can be wired to any power supplies. each switching Button shall be wired to the power supply controlling the electric locking hardware for each opening

Hardware Set 4.1

Doors: 103,108,109,111,112,129,128,127,125,126,122,132 131,130

Each to receive:

3	EA	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2" US26D	MK
1	EA	Office/Entry Lock	8205 LW1L US26D	SA
1	EA	Wall Stop	409 US32D	RO
3	EA	Silencer	608-RKW	RO

Hardware Set 5.1

Doors: 101a,104,105,124,123,116,118,114,203,204,137

Each to receive:

3	EA	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2" US26D	MK
1	EA	Storeroom/Closet Lock	8204 LW1L US26D	SA
1	EA	Wall Stop	409 US32D	RO
3	EA	Silencer	608-RKW	RO

Hardware Set 6.1

Doors: 113,115,202,133,135,136

Each to receive:

3	EA	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2" US26D	MK
1	EA	Privacy Lock	8265 LW1L US26D	SA
1	EA	Surface Closer	351 UO EN	SA
1	EA	Kick Plate	K1050 10" x 34" US32D	RO
1	EA	Wall Stop	409 US32D	RO
3	EA	Silencer	608-RKW	RO

Hardware Set 7.1

Doors: 138,139,140

Each to receive:

3	EA	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2" US26D
1	EA	Office/Entry Lock	8205 LW1L US26D
1	EA	Wall Stop	409 US32D
3	EA	Silencer	608-RKW

READER & POWER SUPPLY BY SECURITY PROVIDER.

MK
SA
RO
RO

SECTION 08 80 00

GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Glass and glazing for storefront and entrance systems referencing this section for products and installation.

1.3 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.
- B. Section 08410 - Aluminum Entrances and Storefronts.

1.4 REFERENCES

- A. ANSI/ASTM E330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- B. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
- C. ASTM C1036 - Flat Glass.
- D. ASTM C1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
- E. FGMA - Glazing Manual.
- F. FGMA - Sealant Manual.
- G. FS TT-C-00598 - Caulking Compound, Oil and Resin Base Type.
- H. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.
- I. FS TT-S-00230 - Sealing Compounds, Synthetic-Rubber Base, Single Component, Chemically Curing.
- J. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.
- K. FS TT-G-410 - Glazing Compound, Sash (Mental) for Back Bedding and Face Glazing (Not for Channel or Stop Glazing).
- L. Laminators Safety Glass Association - Standards Manual.

1.5 PERFORMANCE REQUIREMENTS

- A. Glass and glazing materials of the section shall provide continuity of building enclosure vapor and air barrier:
 - 1. In conjunction with materials described in Section 07900.
 - 2. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with 1985 U.B.C. in accordance with ANSI/ASTM E330.
- C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product data on glass types specified: Provide structural, physical and environmental characteristics, size limitations, special handling, or installation requirements.
- C. Product data on glazing compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples:
 - 1. Submit 2 inch long bead of glazing sealant, color as selected.
 - 2. Submit 12" x 12" piece of each glass indicated.
- E. Manufacturer's installation instructions: Indicate special precautions required.
- F. Manufacturer's certificate: Certify that glass meets or exceeds specified requirements.

1.7 QUALITY ASSURANCE

- A. Perform work in accordance with FGMA Glazing Manual, FGMA Sealant Manual, SIGMA and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install glazing when ambient temperature is less than 50 degrees.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the drawings.
- B. Actual site measurements are the responsibility of the contractor.

1.10 COORDINATION

- A. Coordinate work under provisions of Section 01040.

- B. Coordinate the work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent work.

1.11 WARRANTY

- A. Provide five year manufacturer's warranty under provisions of Section 01700.
- B. Warranty: Include coverage for de-lamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. PPG Industries, Inc.
- B. Ford Glass Division
- C. ASG Industries
- D. Substitutions: Under provisions of Section 01600

2.2 MATERIALS – GLASS

- A. Exterior Glazing - Insulating Glass Units
 - 1. Manufacturers - sealed insulating glass materials
 - a. PPG Industries, Glass Div.
 - b. Libbey-Owens-Ford Co.
 - c. Ford Motor Co., Glass Div.
 - d. Substitutions: Under provisions of Section 01600.
 - 2. Sealed Insulating Glass Materials
 - a. Insulated Glass Units (Type SG-A): ASTM E774 and E773; double pane with outer pane of 1/4 inch clear glass, inner pane of 1/4 inch clear glass, interpane space purged dry hermetic air; total unit thickness of 1 inch - maximum SHGC .40; Maximum U factor .60

Indoor Lite: Clear

Outdoor Lite: Clear Coated 6mm solarban 60
 Coating: PPG Industries, Inc.
 Location: Second Surface (2)
 - 3. Interior Glass Material – non-rated – Tempered Glass 1/4" clear glass.

2.3 GLAZING COMPOUNDS

- A. Shall conform to ASTM C669 and as required by the glazing manufacturer.
- B. Butyl Sealant (Type GC-B): FS TT-S-001657; Shore A hardness of 10-20 black color; non-skinning.
- C. Acrylic Sealant (Type GC-C): FS TT-S-00230, Type II, Class A; single component; cured Shore A hardness of 15-25; color as selected.

- D. Polysulphide Sealant (Type GC-D): FS TT-S-00227, Glass A Type II; two component; cured Shore A hardness of 15-25; color as selected.
- E. Polyurethane Sealant (Type GC-E): FS TT -S-00230, Type II-non-sag, Class A; as recommended by the manufacturer.
- F. Silicone Sealant (Type GC-F): FS TT-S-01543, Class A; single component; chemical solvent curing; capable of water immersion without loss of properties; cured Shore A hardness of 15-25 color as selected.

2.4 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene, 80 - 90 Shore A durometer hardness, length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 - 60 Shore A durometer hardness, minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 - 15 Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; color: black.
- E. Glazing Clips: Manufacturer's standard type.

2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Provide testing and analysis reports of glass under provisions of Section 01400.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify prepared openings under provisions of Section 01040.
- B. Verify that openings for glazing are correctly sized and within tolerance.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Remove all evidence of existing putty glazing from existing steel frames scheduled to be reglazed.

3.3 INSTALLATION

- A. General: Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and gaskets, to achieve airtight and watertight performance, and to minimize breakage.
- B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

3.4 CLEANING

- A. Clean work under provisions of Section 01700.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after work is complete.
- D. Clean glass.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished work under provisions of Section 01500.
- B. After installation, mark pane with an 'X' by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.
- C. Protect glass from contact with contaminating substances resulting from construction operations.
- D. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- E. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

END OF SECTION

SECTION 08880

BULLET RESISTANT ALUMINUM WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Glass and glazing for sections referencing this section for products and installation.

1.3 RELATED SECTIONS

- A. Section 07900 - Joint Sealers.
- B. Section 08800 – Glazing Key and Schedule

1.4 REFERENCES

- A. American Welding Society (AWS) (www.aws.org) D1.2/D1.2M - Structural Welding Code - Aluminum.
- B. American Architectural Manufacturers Association (AAMA) (www.aamanet.org) 611 - Voluntary Specification for Anodized Architectural Aluminum.
- C. ASTM International (ASTM) (www.astm.org) B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. Underwriters Laboratories (UL) (www.ul.com) 752 - Bullet Resisting Equipment.

1.5 PERFORMANCE REQUIREMENTS

- A. Design Requirements: Provide window frames of “non-ricochet type” intended to permit capture and retention of attacking projectile, lessening potential of random injury or lateral penetration.

1.6 SUBMITTALS

- A. Submittals for Review:
 - 1. Shop Drawings: Include window profiles and sizes, type and spacing of frame anchors, reinforcement size and locations, details of joints and connections, and welding details.
 - 2. Product Data: Include product description for window assemblies including bullet-resistant ratings.
 - 3. Samples: 2 x 2 inch coating samples [showing available colors.]
- B. Closeout Submittals:
 - 4. Maintenance Data: Include instructions for cleaning of glazed panels.

1.7 QUALITY ASSURANCE

- A. Fixed Window Assemblies: Ballistic Level 3 Tested to UL 752

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install glazing when ambient temperature is less than 50 degrees.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on the drawings.
- B. Actual site measurements are the responsibility of the contractor.

1.10 COORDINATION

- A. Coordinate work under provisions of Section 01040.
- B. Coordinate the work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent work.

1.11 WARRANTY

- A. Provide five year manufacturer's warranty under provisions of Section 01700.
- B. Warranty: Include coverage for de-lamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Contract Documents are based on products by ARMORTEX, 5926 Corridor Parkway, Schertz, Texas, 800-880-8306, www.armortex.com.
- B. Substitutions: Under provisions of Section 01600

2.2 MATERIALS – GLASS

- A. Aluminum Extrusions:
 1. ASTM B221, 6061-T6 alloy and temper; minimum 38.0 KSI ultimate tensile strength and minimum 35.0 KSI yield strength.
- B. Bullet-Resistant Composite: UL Listed Bullet Resistant Composite by ARMORTEX.
- C. Glazing: UL Listed Laminated Glass

2.3 FABRICATION

- A. Frames:
 1. Fabricate from aluminum extrusions lined with bullet-resistant composite.
 2. Weld frame corners; knock-down and mechanical joints not acceptable.
 3. Frame modules capable of being joined with other frame modules to form continuous line.
 4. Replacement of glazing from secure side of window, not requiring removal of frame from opening.
- B. Welding: In accordance with AWS D1.2/D1.2M. Grind exposed welds flush and smooth.
- C. Finish work neat and free from defects.

- D. Allowable Tolerances: Plus or minus 1/16 inch for frame opening width, height, diagonal dimensions, and overall width and height (outside to outside).

1.2 FINISHES

- A. Aluminum: AAMA 611, Architectural Class I anodized, clear

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify prepared openings under provisions of Section 01040.
- B. Verify that openings for glazing are correctly sized and within tolerance.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Remove all evidence of existing putty glazing from existing frames scheduled to be re-glazed.

3.3 INSTALLATION

- A. Install window assemblies in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Set plumb, square, and level.
- C. Secure to adjacent construction using fastener type best suited to application.
- D. Field alterations to window assemblies not permitted unless approved in advance by manufacturer and Architect.

3.4 CLEANING

- A. Clean work under provisions of Section 01700.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after work is complete.
- D. Clean glass.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished work under provisions of Section 01500.

- B. Protect glass from contact with contaminating substances resulting from construction operations.
- C. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
- D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Metal stud wall and wall furring
- B. Gypsum Board
- C. Taped and Sanded joint treatment

1.3 RELATED SECTIONS

- A. Section 06100 – Rough Carpentry: Wood blocking for support of toilet accessories.
- B. Section 08100 – Hollow Metal Frames.
- C. Section 09511 – Painting: Surface Finish.

1.4 REFERENCES

- A. ANSI/ASTM C36 - Gypsum Wallboard.
- B. ANSI/ASTM C79 - Gypsum Sheathing Board.
- C. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- D. ANSI/ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- E. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.
- F. ANSI/ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- G. ANSI/ASTM E119 - Fire Tests of Building Construction and Materials.
- H. GA-201 - Gypsum Board for Walls and Ceilings.
- I. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.

1.5 SYSTEM DESCRIPTION

1.6 QUALITY ASSURANCE

- A. Applicator: Company specializing in gypsum board systems work with three years' documented experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for fire rated assemblies.
 - 1. NA

1.8 SUBMITTALS

- A. Provide product data on metal framing, gypsum board, joint tape decorative finish, and accessories.
- B. Submit two samples of pre-decorated gypsum board 12x12 inch in size, one illustrating a sand texture finish and one illustrating an orange peel texture. Selection will be made by the architect.
- C. Submit manufacturer's installation instructions and Material Safety Data Sheets under provisions of Section 01300.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. United States Gypsum Co. - Gypsum Panels
- B. Dietrich - metal stud system.
- C. Other acceptable manufacturers offering equivalent products:
 - 1. Gold Bond Products, Inc.
 - 2. Redman Industries Inc.
- D. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

- A. Framing
 - 1. Studs and Tracks: ANSI/ASTM C645; galvanized sheet steel, stud width 2 1/2", 3 5/8" and 6" as noted, interior wall framing to be 25 gauge thickness (0.0209 inches), exterior wall framing to be 18 gauge thickness (0.0478 inches), 'C' shape with return edges.
 - 2. Slotted Tracks: ASTM A1003, ASTM C 645; 3 5/8" and 6" width by 20 gauge thickness (0.0359 inches)
 - 3. Stud Bridging: ASTM C955; 1 1/4"x 1 1/4" by 16 gauge (0.0566 inches)
 - 4. Furring and Framing: ANSI/ASTM C645; 2 1/2", 3 5/8" by 25 gauge (0.0209 inches).
 - 5. Resilient channel as shown for acoustic rated assemblies – ClarkDietrich RC-1 Pro resilient channel (RCUR).
 - 6. Vinyl L-bead with compressible foam – head of acoustic wall assemblies – ClarkDietrich UltraBEAD
- B. Fasteners: ANSI/ASTM C1002
- C. Adhesive: ANSI/ASTM C557 and as recommended by the manufacturer.

- D. Gypsum Board Materials.
 - 1. Moisture Resistant Gypsum Board: ANSI/ASTM C36; moisture resistant, 5/8" inch thick, maximum permissible length; ends square cut, tapered edges.
 - 2. Fire Rated Gypsum Board: ANSI/ASTM C36; fire resistive type, UL rated; 5/8" inch thick, maximum permissible length; ends square cut, tapered edges.

2.3 ACCESSORIES

- A. Corner Beads: Metal equal SLOC by United States Gypsum.
- B. Edge Trim: Metal equal to No. 200-A by United States Gypsum.
- C. Control Joints: Metal equal to United States Gypsum
- D. Joint Materials: ANSI/ASTM C475; reinforcing tape, joint compound, adhesive and fasteners.
- E. Grounds: Concealed 9 gage sheet metal or fire treated 2x wood.
- F. Acoustic Batt: unfaced R 11 (3 5/8" studs) and R19 (6" studs), refer to Section 07213.
- G. Corner Guards: Equal to Wallguard, 877-943-6826, Defender Series 2305, 2" wings by 48" long with top and bottom matching caps, Class A fire rating, textured vinyl cover of selected color, continuous aluminum retainer anchored to the wall. Top of guard to be 42" above finished floor.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of substrate.

3.2 METAL STUD INSTALLATION

- A. Install studding in accordance with ANSI/ASTM C754.
- B. Metal Stud Spacing: 16 inches on center.
- C. Partition Heights: To minimum 6 inches above suspended ceilings, or as noted on drawings. Install additional bracing for partitions extending above ceiling. Allowable deflection of L/240.
- D. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- E. Blocking: Nail wood blocking to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware.
- F. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.

3.3 WALL FURRING INSTALLATION

- A. Erect free-standing metal stud framing tight to masonry and plaster walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.
- B. Erect furring studs vertically. Secure in place at maximum 16" on center.
- C. Space furring studs maximum 16 inches on center.
- D. Install thermal insulation batts between studs in accordance with manufacturer's instructions.

3.4 CEILING FRAMING INSTALLATION

- A. Install in accordance with GA 201 and GA 216.
- B. Coordinate location of hangers with other work.
- C. Install ceiling framing independent of walls, columns, and above-ceiling work.
- D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
- E. Laterally brace entire suspension system.

3.5 ACOUSTICAL ACCESSORIES INSTALLATION

- A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items with or behind partitions, and tight to items passing through partitions.
- B. Install acoustical sealant at gypsum board perimeter at:
 - 1. Metal framing: two beads.
 - 2. Slab/Sill Track: two beads.
 - 3. Face layer.
 - 4. Caulk all penetrations of partitions by conduit, pipe, ductwork, rough-in boxes, and all other wall penetrations.

3.6 GYPSUM BOARD INSTALLATION

- A. Install gypsum board in accordance with GA 201 and GA 216.
- B. Erect single layer of gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- D. Use screws when fastening gypsum board to metal furring or framing.
- E. Treat cut edges and holes in gypsum sheathing with sealant, or tape.
- F. Place control joints consistent with lines of building spaces as directed.
- G. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

- H. Install concealed grounds in wall framing where shown or required, if not shown, for mounting of surface hardware. Concealed grounds are not to be obvious when gypsum board system is finished.

3.7 PERMANENT MARKING AND IDENTIFICATION OF FIRE WALLS

- A. Permanently identify with red stenciled 3-inch high lettering all fire rated walls. Identification to be located on the fire-rated wall/partition above ceilings and at exposed areas (such as Mechanical and Electrical Equipment Rooms), on 10-foot intervals and as high as possible and still visible from the finished floor and include the wording "FIRE WALL". Areas of fire-rated walls/partitions exposed to viewing by the public shall be exempt from stenciling.

3.8 JOINT TREATMENT

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
- B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- C. Erect pre-decorated gypsum board vertically, with exposed batten fastening system.
- D. Erect in accordance with manufacturer's instructions.
- E. Install No. 093 control joints in the interior face of gypsum board partitions opposite all exterior expansion joints. Install control joints at other locations as directed.

3.9 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 30 13

CERAMIC TILE FINISH

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 REFERENCES

- A. The latest editions of the following specifications and references govern the work in this section and constitute minimum requirements. Where specific requirements of this section are more stringent, they shall supersede the corresponding requirements of these reference specifications.
1. American National Standards Institute, Inc. (ANSI) Standards:
 - a. A108.1-1985 Installation of Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile with Portland Cement Mortar.
 - b. A108.4-1985 Installation of Ceramic Tile with Water-Resistant Organic Adhesives.
 - c. A108.5-1985 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar of Latex-Portland Cement Mortar.
 - d. A118.1-1985 Dry-Set Portland Cement Mortar.
 - e. A118.4-1985 Latex-Portland Cement Mortar.
 - f. A118.6-1985 Ceramic Tile Grouts.
 - g. A136.1-1985 Organic Adhesives for Installation of Ceramic Tile. (R1972)
 2. American Society for Testing and Materials (ASTM) Publications:
 - a. A 185-85 Steel Welded Wire Fabric, Plain for Concrete Reinforcement.
 - b. C 144-84 Aggregate for Masonry.
 - c. C 150-84 Portland Cement.
 - d. C 206-84 Finishing Hydrated Lime.
 - e. C 207-79 (R1984) Hydrated Lime for Masonry Purposes.
 - f. C 395-85 Chemical-Resistant Resin Mortars.
 3. Tile Council of America, Inc. (TCA):
 4. TCA 137.1 Recommended Standard Specifications for Ceramic Tile. Handbook for Ceramic Tile Installation

1.3 DESCRIPTION OF WORK

- A. This section includes ceramic surfacing units made from clay or other ceramic materials. The types of work of this section include:
1. Ceramic Mosaic Tile.
 2. Ceramic Cove Base, Molded Corners, Bullnoses.
 3. Glazed Wall Tile.

1.4 QUALITY ASSURANCE

- A. Tile Manufacturing Standard: TCA 137.1. Furnish tile complying with standard grade requirements unless indicated otherwise.
- B. Proprietary Materials: Handle, store, mix and apply proprietary setting and grouting materials in compliance with manufacturer's instructions.

- C. Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.5 SUBMITTALS

- A. Submit manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors available, for each tile specified. Include samples of grout and accessories requiring color selection.
- B. Furnish the manufacturer's signed Master Grade Certificates for each type of tile specified.

1.6 HANDLING

- A. Deliver packaged materials and store in original containers with seals unbroken and labels intact until time of use, in accordance with manufacturer's instructions.

1.7 JOB CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation in accordance with referenced standards and manufacturer's printed recommendations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Tile 2 Products – Administration and Staff Toilet rooms
 - 1. Glazed wall tile: Standard grade, not less than 1/4" thick with cushion edges. Provide all necessary shapes and trimmers of similar tile. Tile size, color, and pattern selections will be equivalent to:
 - a. Wall tile: field - Daltile, VOLUME 1.0, size 12" x 24". Color to be selected from manufacturers full range of colors.
 - 2. Floor Tile: VOLUME 1.0, size 12" x 24". Color to be selected from manufacturers full range of colors.
 - 3. Trim and Special Shapes: Color to be selected from full range of manufacturers option.
 - a. Base: Schluter Dilex - AHK
 - b. External Corners: Schluter Rondec
 - c. Internal Corners: Field-buttet square, except use square corner, combination angle and stretcher type cap.
 - d. Bullnose top course – Schluter Rondec.
 - e. Tile transitions – Schluter Reno-U
- B. Mortar and Grout:
 - 1. Portland Cement Mortar and Grout: ANSI A 108.1.
 - a. Provide reinforcing wire fabric.
 - b. Color pigment: Mineral oxides, unaffected by lime, cement or weathering. Use when required to produce selected grout color.
 - 2. Dry-Set Mortar: Factory-sanded portland cement and additives; ANSI A 118.1. Use only the type of dry-set mortar to set types of tile for which they are labeled.

3. Latex-Portland Cement Mortar: Latex modified portland cement dry-set mortar; ANSI 118.4.
 4. Organic Adhesive: ANSI A 136.1; of proper type for intended use with respect to moisture resistance, tile material and backing as certified by adhesive manufacturer.
 - a. Provide Primer-sealer where recommended by manufacturer.
 5. Dry-Set Grout: Proprietary compound composed of portland cement and additives formulated for the type of tile installed. Color as selected by architect from manufacturer's standard.
 6. Latex-Portland Cement Grout: Proprietary compound composed of portland cement with latex additive for a more flexible and less permeable grout.
 - a. Wall Grout: Custom Building Products poly blend non-sanded grout - color to be selected by architect from manufacturer's full range of colors.
 - b. Floor Grout: Custom Building Products poly blend non-sanded grout – color to be selected by architect from manufacturer's full range of colors.
 7. Provide product with latex additive which is compatible with latex additive in latex-portland cement mortar.
- C. Extra Materials:
1. Provide one unopened carton of each tile used on the project. Clearly identify on the carton the tile type, color, size, building in which it was installed, and name and number of room installed.
 2. Deliver extra cartons to project site for verification. Owner will store cartons at their preference.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Tile Installation Standards:
1. ANSI Standards: Comply with applicable requirements of the following, except as otherwise indicated.
 - a. ANSI A108.1: ANSI 108.4 or ANSI 108.5, as applicable.
 2. Comply with manufacturer's instructions for mixing and installation of proprietary materials.
 3. Extend tile work into recesses under or behind equipment and fixtures to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstruction, edges and corners without disruption pattern or joint alignment.
 4. 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 that plates, collars, or covers overlap tile.
- B. Placement Methods:
1. Thin-set Installations: Dry-set portland cement mortar, latex-portland cement mortar, or organic adhesive, to suit substrate.
 2. Submit for review and approval a water resistant adhesive for all floor tile installations. Adhesive is to form a continuous waterproof coating under the floor tile and behind the base tile. Stop coating at the top of the base tile.
- C. Jointing Pattern:
1. Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.
 2. Neatly place tiles uniformly spaced around floor drains, wall hydrants, or other finished items that do not include cover plates to conceal uneven edges or spacing.

- D. Expansion and Control Joints:
 - 1. Provide openings for joints where shown and to comply with details, or if not shown and detailed, to comply with recommendations in TCA "Handbook for Ceramic Tile Installation." Sealant work is specified in Section 07900.
 - 2. All vertical wall intersections shall have a continuous bead of water and mildew resistant sealant from floor to ceiling. The sealant color shall match that of the grout.
- E. Thresholds:
 - 1. Use bullnose ceramic tiles of same color and material between door frames when terminating ceramic tile.
 - 2. Install sealant between bullnose ceramic tile and adjacent floor finish, except carpeting.
- F. Grout:
 - 1. 11.7.1 Use dry-set grout or latex-portland cement grout as recommended.

3.2 CLEANING

- A. Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
- B. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
- C. Leave finished installation clean and free of cracked, shipped, broken, unbonded, or otherwise defective tile work.
- D. When recommended by tile manufacturer, apply protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent damage and wear.
- E. Prohibit foot and wheel traffic from using tiled floors for at least three days after grouting is completed.
- F. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

SECTION 09 51 00

SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 GENERAL NOTES

- A. This contractor shall furnish all labor and materials necessary to complete all acoustical ceiling work as shown on the drawings or as specified herein. This contractor shall be responsible for the furnishing and installation of all accessories required for the completion of the work.
- B. See reflected ceiling plan for locations of electrical and mechanical items related to the acoustical ceilings. Cooperate with electrical and mechanical contractors to insure a first class appearance in the completed work.

1.3 RELATED SECTION

- A. Section 01700 - Contract Closeout

1.4 COOPERATION

- A. This contractor shall consult and cooperate with trades whose work precedes and follows ceiling installation to permit orderly procedure in executing work under this contract. Installation of tile shall not start until foundation work to receive the tile has been obtained to proceed. The contractor shall give the architect advance notices for such operations.
- B. The contractor shall inspect personally all surfaces to receive material and shall report to the architect any defects or conditions which would affect his installation.

1.5 WARRANTY

- A. This contractor shall furnish a written warranty that the work under this division shall be free from defects of materials and workmanship for a period of two years from the date of final acceptance of his work, and all other work damaged thereby, which becomes defective during the term of the warranty.
- B. The following shall be judged as defective work: loosening, buckling, undue shrinkage, warping, cracking, settling, chipping, spotting, and loss of acoustical properties of material.

1.6 SUBMITTAL

- A. Submit to the architect for approval four sets of manufacturer's literature describing the ceiling boards and suspension system proposed for the project.

PART 2 PRODUCT

2.1 MATERIALS

- A. Type I - Ceiling board shall be 24 x 24 x 15/16 inches, with an NRC of 0.70, Class A rating, and a white color coating.
 - 1. Armstrong Interiors, Inc. – School Zone Fine Fissured Airassure
- B. Exposed suspension system shall be equal to Armstrong Prelude XL and white enameled steel. Main beams shall be generally spaced at 24 inches on center. Use 24 inch cross tees and 24 inch sub cross tees. Wall angle shall be white enameled steel. Provide an intermediate-duty classification.
- C. Type II - Tectum ceiling Direct attached - Tectum DesignArt - Lines Ceiling 24”x48” – color to be selected from full line of color selection options. Pattern to be Droplet B. Mount to existing roof joists with furring strips installation Type D-20.
- D. Type III - Tectum ceiling lay-in - Tectum DesignArt - Lines Tegular Ceiling 24”x48” – color to be selected from full line of standard color selection options. Pattern to be Droplet B. Installed in exposed suspension system above.
- E. Cloud trim – Axiom Classic – 10” – color to be selected from manufacturer’s full line of color selections.

PART 3 EXECUTION

3.1 EXPOSED SUSPENSION SYSTEM

- A. The contractor shall employ workmen who are experienced in the erection of the types of ceilings specified and shall maintain competent supervision of the work at all times.
- B. Erect runner level and true to the elevation shown on the drawings. Start channels a minimum of 1 foot from walls, and space 2 feet on center thereafter. Where splices occur in channels, use special splice bars as furnished with system specified.
- C. Lay out ceiling work symmetrically in the various rooms with no less than one-half tile at the walls. Cut tile accurately around electrical outlets.
- D. Upon completion of the work, all tile shall be cleaned and left free from defects of any kind.
- E. In general, lighting fixtures of fluorescent type shall be suspended directly on the runner bars. Where fixture centers between two runner bars, both shall be main runner bars. See reflected ceiling plans for fixture locations.
- F. Install perimeter ceiling angle tight to wall partition, free from curves, breaks, and other irregularities. Fill any gaps at wall angle and wall partition intersection with caulk.

3.2 HANGERS

- A. Hanger wires shall be #12 soft annealed wire. Hanger wires shall be plumb and taut in the completed work. Slanting of hanger wires will not be permitted unless an equal and opposite hanger wire is installed to offset the thrust of the original wire hanger. This may be done only with the expressed permission of the architect.
- B. Where hanger wires occur directly under ductwork or other overhead obstructions, provide a trapeze of 1-1/2 inch channel iron. Install regular hanger wire at proper location along the length of trapeze.

- C. The use of bridging angles spanning between bar joists is expressly forbidden for attachment of hanger wires for supporting ceiling suspension systems.
- D. Hanger wires shall be attached to the bottom chords of bar joists or to special scissor clips attached to steel sub-purlins supporting the roof deck.
- E. Where acoustical board ceilings occur below concrete structural members provide power driven studs with eyes into vertical face of concrete joists.

3.3 INSTALLATION OF TILES

- A. Step 1: Contractor shall only install ceiling tiles in which a building system is anchored to or through the tile in order to complete the installation of the building system.
 - 1. Such building systems include, but not limited to fire sprinkler heads, fire/smoke detectors, audio equipment and cameras.
 - 2. Once Step 1 is complete and systems are operational, the contractor shall schedule a pre-final building system walk through with the architect.
 - 3. Do not install ceiling tiles that do not support a building system component, building systems are to be visible via omitted ceiling tile openings.
- B. Step 2: After pre-final walk through and all corrective work is completed, install balance of ceiling tiles.
 - 1. Complete ceiling system is to be installed prior to final project walk through.

3.4 EXTRA TILE

- A. Upon completion of the work furnish to the owner one unopened carton of each type of acoustical board installed in the project.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND STAIR TREADS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base
 - 2. Vinyl stair treads

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore Standard.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Resilient Base Standard: ASTM F 1861.

1. Material Requirement:

a. Type TV (vinyl, thermoplastic).

- 1) Manufacturing Method: Group I (solid, homogeneous).
- 2) Style: Cove (base with toe). Minimum Thickness: 0.080 inch (2.0 mm).
- 3) Height: 4 inches (102 mm).
- 4) Lengths: Coils in manufacturer's standard length.
- 5) Outside Corners: Preformed.
- 6) Inside Corners: Job formed or preformed.
- 7) Finish: As selected by architect from manufacturer's full range
- 8) Colors and Patterns: As selected by architect from manufacturer's full range of industry colors

D. Vinyl Stair Tread

1. Material Requirement

a. Type TV (vinyl, thermoplastic)

- 1) Provide stringers and risers
- 2) Nose type – Square
- 3) Nose length – 2”
- 4) Leading Edge Thickness 5/32”
- 5) Back Edge Thickness 5/64”
- 6) Nominal Tread Depth 12 1/4”
- 7) Tread Length 48” field cut to match existing conditions.
- 8) Safety Strip Width One 2” insert
- 9) Safety Strip Spacing 3/4” from nose
- 10) Safety Strip Material : Carborundum
- 11) Weight per Lineal Foot 1.3 lbs

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

2.3 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by floor covering manufacturer. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

2.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of product.

END OF SECTION

SECTION 09 65 19.23

Resilient Tile Flooring

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.

B. Related Documents

1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.

1.02 REFERENCES

A. Armstrong Flooring Technical Manuals

1. Armstrong Flooring Guaranteed Installation Systems manual, F-5061
2. Armstrong Flooring Maintenance Recommendations and Procedures, manual, F-8663.

B. ASTM International:

1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
4. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
5. ASTM F 1700 Standard Specification for Solid Vinyl Tile
6. ASTM F 1861 Standard Specification for Resilient Wall Base
7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

C. National Fire Protection Association (NFPA):

1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials

D. Standards Council of Canada

1. CAN/ULC-S102.2 Standard Test Method for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
- B. Administrative Requirements
 1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.
- C. Test Installations/ Mock-ups: Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.
 1. Mock-Up Size: 18" x 18"
 2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
 3. Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.
- D. Sequencing and Scheduling
 1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.
 2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

1.04 SUBMITTALS

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. for flooring and accessories.
- B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.
- C. Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.
- D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- E. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein

1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.
- B. Select an installer who is experienced and competent in the installation of Armstrong resilient solid vinyl tile flooring and the use of Armstrong Flooring subfloor preparation products.
 1. Engage installers certified as Armstrong Commercial Flooring Certified Installers

2. Confirm installer's certification by requesting their credentials
- C. Fire Performance Characteristics: Provide resilient tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:
 1. ASTM E 648 (NFPA 253) Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
 2. ASTM E 662 (NFPA 258) (Smoke Generation) Maximum Specific Optical Density of 450 or less
 3. CAN/ULC-S102.2 – Flame Spread Rating and Smoke Developed – Results as tested

1.06 DELIVERY, STORAGE AND HANDLING

- A. Comply with Division 1 Product Requirements Sections
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- D. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.07 PROJECT CONDITIONS

- A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of [100°F (38°C)][85°F (29°C)] for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to the Armstrong Flooring Guaranteed Installations Systems manual, F-5061 for a complete guide on project conditions.

1.08 LIMITED WARRANTY

- A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
- B. Limited Warranty Period: 20 years for Natural Creations with Diamond 10 Technology.
- C. The Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.
- D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.09 EXTENDED SYSTEM LIMITED WARRANTY

- A. Resilient Flooring System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace system (subfloor preparation products, adhesive, and floor covering) that fails within the warranty period.
- B. Limited Warranty Period: 10 years on top of the Resilient Flooring Limited Warranty
- C. Levelling compound as recommended by manufacturer.

- D. The installation of an Armstrong Flooring product along with the recommended Armstrong Flooring adhesive, as well as any one of the Strong System subfloor preparation products listed above, provides 10 additional years of limited warranty coverage. The Strong System limited warranty covers the installation integrity for the length of the flooring product warranty plus 10 years. In order to qualify for the Strong System Warranty, any subfloor preparation product needed for an installation must be an Armstrong Flooring product.
- E. For the System Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.
- F. When Armstrong Flooring Strong System subfloor preparation products are used with other manufacturers' floor coverings, adhesives, or other subfloor preparation products, Armstrong Flooring warrants our products to be free from manufacturing defects from the date of purchase through the limited warranty period of 15 years.

1.10 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.
 - 1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
 - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Resilient tile flooring, wall base, adhesives and subfloor preparation products and accessories:
 - 1. Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17604, www.armstrongflooring.com/commercial
 - 2. Manufacturer must have a headquarters in the United States of America

2.02 RESILIENT TILE FLOORING MATERIALS

- A. Provide Exchange® with Diamond 10® Technology: Coalesce® Luxury Solid Vinyl Tile Flooring manufactured by Armstrong Flooring Inc.
 - 1. Description: A layered construction consisting of a tough, clear, rigid vinyl wear layer protecting a high-fidelity print layer on a solid vinyl backing. Protected by a diamond-infused UV-cured polyurethane finish, the wear surface is embossed with different textures to enhance each of the printed visuals. Colors are insoluble in water and resistant to cleaning agents and light.
 - 2. Reference specification - ASTM F 1700, "Standard Specification for Solid Vinyl Tile", Class III, Type B – Embossed Surface. Meets requirements for size, squareness, thickness, thickness of wear layer, residual indentation, resistance to chemicals, resistance to light and resistance to heat.
 - 3. Pattern and Color: color selected from the full range currently available from Armstrong Flooring Inc., including "create your own color" options. Pattern and colors as shown on the drawings.
 - 4. Size: 6 in. x 36 in.
 - 5. Wear layer thickness: 0.020 (0.5 mm)
 - 6. Thickness: 1/8"/0.125 in. (3.2mm)

2.03 PRODUCT SUBSTITUTION

- A. Substitutions: No substitutions permitted because of the specific attributes listed in Section 2.02.

2.05 ADHESIVES

- A. Provide Armstrong S-288 Flooring Adhesive under the flooring and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

2.06 ACCESSORIES

- A. Patch and level existing concrete sub-floors as required for even installation.
- B. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- C. Provide transition/reducing strips tapered to meet abutting materials.
- D. Provide threshold of thickness and width as shown on the drawings.
- E. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
- F. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).
- B. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.03 PREPARATION

- A. Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong Flooring as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- B. If moisture is present above recommended levels - Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, mitigate moisture and other defects with Armstrong Flooring as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- C. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material. Refer to the Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- D. When using S-288 Adhesive, perform subfloor moisture testing in accordance with and Bond Tests as described in publication F-5061, "Armstrong Flooring Guaranteed Installation System," to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Internal relative humidity of the concrete shall not exceed 99%. MVER shall not exceed 8 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained
- E. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

3.04 INSTALLATION OF FLOORING

- A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer's warranty listed in Section 1.08.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.
- D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

- E. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Refer to specific rolling instructions of the flooring manufacturer
- F. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.05 INSTALLATION OF ACCESSORIES

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- D. Apply [butt-type] [overlap] metal edge strips where shown on the drawings, [before] [after] flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.06 CLEANING

- A. Perform initial and on-going maintenance according to the latest edition of Armstrong Flooring Maintenance Recommendations and Procedures manual, F-8663.

3.07 PROTECTION

- A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See Finishing The Job in the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061.)

END OF SECTION

SECTION 09680

MODULAR CARPET TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes modular carpet tile and Milliken Non-Reactive Standard Adhesive

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Milliken Carpet Installation Instructions
- C. Milliken Non-Reactive Standard Warranty
- D. Specification Sheet, Milliken Non-Reactive Standard Adhesive

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - 1) Concrete subfloors must be structurally sound, clean, dust free, smooth, trowel finish, and level.
 - 2) Cracks and holes in excess of 1/8" (3.2mm) should be filled with a Portland Cement based floor patching material (Gypsum based compounds are not recommended).
 - a) XL Brands Prelude is a recommended product should treatment of porous concrete slab be deemed necessary.
 - 3) Inspection should determine that slab is on or above grade, including a review of any potential concrete additives and mold release agents that could affect compatibility with Milliken Non-Reactive Standard Adhesive.
 - 4) No chemical incompatibility exists between Milliken modular carpet or Milliken Non-Reactive Standard Adhesive and any existing floor covering adhesive. This includes "cutback", asphalt emulsion, general-purpose adhesive, epoxy and any other commonly found flooring adhesives. The only physical requirement for existing adhesive films is that they be smooth, non-tacky, and that residual trowel notches be reduced to 1/32" (0.8mm) or less. In most cases

- the removal of the existing floor covering accomplishes this with only normal sweeping, cleaning, and patching required prior to beginning installation.
- 5) Regardless of adhesive type, the existing layer should have minimal residual tack. There is no chemical reaction; however, excessive tack may cause the carpet modules to become bonded too aggressively to the floor over time. This tack can be minimized or eliminated by sifting Portland cement based patch powder into the existing film and sweeping away the excess or by applying a very thin layer of Portland patch.
 - 6) If additional smoothing is required and residual adhesive is black (cutback or asphalt emulsion) smoothing must be accomplished by applying a very thin layer of one of the Portland Cement based patching compounds.
 - 7) If residual adhesive is not black, scrape or sand until smooth and non-tacky as required.
- d. Review installation instructions and Milliken warranty requirements, including the following:
- 1) No moisture testing is required for On Grade renovations provided:
 - a) Confirmed and intact ASTM E-1745 vapor retarder (Class B minimum) placed in accordance with ACI 302-2001 and directly in contact with the concrete placement.
 - b) No visible water on the surface.
 - c) Acclimatized to service conditions.
 - d) Floor prep must be performed in accordance with ASTM F 710-11 unless specifically allowed per manufacturer's installation instructions.
 - e) All topical compounds must be removed prior to application of adhesive.
 - f) Bond test is required with archived written and photo documentation, including any corrective action required.
 - 2) If there is no vapor retarder or the presence of a vapor barrier is unknown for On Grade renovations, product may be installed if the moisture levels do not exceed 95% relative humidity as measured by the in situ relative humidity probe test per the latest edition of ASTM F2170, as described in the Milliken Non-Reactive Standard Adhesive product specifications and Milliken's then current published instructions for installation of modular carpet.
 - 3) No moisture testing is required for Above Grade renovations provided:
 - a) No visible water on the surface.
 - b) Acclimatized to service conditions.
 - c) Floor prep must be performed in accordance with ASTM F 710-11 unless specifically allowed per manufacturer's installation instructions.
 - d) All topical compounds must be removed prior to application of adhesive.
 - e) Bond test is required with archived written and photo documentation, including any corrective action required.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations specific to a Renovation as opposed to New Pour.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of installation.
4. Pattern of installation.
5. Pattern type, location, and direction.
6. Pile direction.
7. Type, color, and location of insets and borders.
8. Type, color, and location of edge, transition, and other accessory strips.
9. Transition details to other flooring materials.

C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.
- B. Qualification Data: For Installer.
- C. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 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.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has 5 years of comparable experience on installing commercial carpet and 5 years installing products by all specified carpet manufacturers.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."
- B. Carpet tiles and adhesives shall be stored between 40° F and 100° F in a clean, dry, enclosed space off the ground and shall be conditioned to between 60° F and 90° F for 48 hours prior to installation.

1.10 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weather tight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants.
- C. Floor temperature should be 60 °F minimum for proper adhesive curing and performance.
- D. If subfloor is contaminated with an oily residue either from removal of “cutback” during asbestos abatement or from a previous end use such as metal fabrication, this residue MUST be totally removed or covered prior to applying modular adhesive and carpet.
- E. Product is allowed to be installed over moisture stained concrete. Products not allowed to be installed over moisture stained concrete must be noted.
- F. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.
- G. Requisite field conditions for Milliken Non-Reactive Standard Adhesive.
 - 1. No moisture testing is required for On Grade renovations provided:
 - a. Confirmed and intact ASTM E-1745 vapor retarder (Class B minimum) placed in accordance with ACI 302-2001 and directly in contact with the concrete placement.
 - b. No visible water on the surface.
 - c. Acclimatized to service conditions.
 - d. Floor prep must be performed in accordance with ASTM F 710-11 unless specifically allowed per manufacturer’s installation instructions.
 - e. All topical compounds must be removed prior to application of adhesive.
 - f. Bond test is required with archived written and photo documentation, including any corrective action required.
 - 2. If there is no vapor retarder or the presence of a vapor barrier is unknown for On Grade renovations, product may be installed if the moisture levels do not exceed 95% relative humidity as measured by the in situ relative humidity probe test per the latest edition of ASTM F2170, as described in the Milliken Non-Reactive Standard Adhesive product specifications and Milliken’s then current published instructions for installation of modular carpet.
 - 3. No moisture testing is required for Above Grade renovations provided:
 - a. No visible water on the surface.
 - b. Acclimatized to service conditions.

- c. Floor prep must be performed in accordance with ASTM F 710-11 unless specifically allowed per manufacturer's installation instructions.
- d. All topical compounds must be removed prior to application of adhesive.
- e. Bond test is required with archived written and photo documentation, including any corrective action required.

H. Precautions for cleaning materials and methods that could be detrimental to carpet tile

1.11 WARRANTY

A. Warranties are applicable to all Milliken commercial modular products. These warranties are subject to the specific Warranty Terms and Conditions provided by Milliken related to commercial modular carpet products, and related details about the test methods supporting these warranties are available upon request.

1. These warranties shall not apply to carpet which has been placed in storage for extended periods, exposed to temperature extremes, bent or deformed.
2. Additionally, these warranties do not cover damage arising from any use that is different from the normal, intended use of the carpet, including, but not limited to:
 - a. Damage caused by chlorinated or any other solvent-based cleaning agents.
 - b. Damage caused by exposure to substances or contaminants which degrade or destroy color in carpet.
 - c. Damage caused by use of inappropriate maintenance methods or unapproved maintenance service providers.
 - d. Damage caused by sharp objects.
 - e. Damage caused by Installer or workmanship of related Installer.
 - f. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
3. Failures include, but are not limited to, the following:
 - a. The carpet will lose no more than 10% of its face fiber by weight during the Lifetime of the carpet.
 - 1) If the carpet is installed on stairs, the warranty will be limited to 5 years.
 - 2) Relevant claims require submittal of a 1 square yard sample of unused attic stock and a like size piece from referenced area related to warranty to be submitted to independent testing lab for verification.
 - b. Staining/soiling resistance
 - 1) Carpet treated with StainSmart will resist staining and soiling during the Lifetime of the carpet.
 - c. Color pattern permanency
 - d. Delamination of backing
 - e. Edge ravel
 - f. Tuft bind
 - g. Floor Compatibility
 - h. Antistatic
 - i. Antimicrobial Protection
 - 1) Milliken warrants that the AlphaSan antimicrobial agent will remain active during the Lifetime of the carpet.
 - j. Flammability
 - k. Cushion Resiliency
 - l. Dimensional Stability

- m. Floor Release
- n. Moisture Resistance

4. Warranty Period: the Lifetime of the original carpet installation, beginning at the date of the applicable invoice and remaining in effect throughout the period of time that the original purchaser of the original carpet chooses to keep the carpet on the floor at the original installation site.

B. Special Warranty for Milliken Non-Reactive Standard Adhesive: Manufacturer warrants that the Milliken Non-Reactive Standard Adhesive, when used with current Milliken modular carpet with Comfort Plus ® or Underscore™ backing systems, will form a bond that provides tack and resistance to lateral movement while allowing for the removal of the modular carpet in high moisture slab conditions with no limit on relative humidity as long as there is no visible water on the slab surface for the Lifetime of the original carpet installation in Commercial installations subject to meeting the following conditions:

1. No moisture testing required if on-grade installations that have a confirmed vapor retarder consistent with ASTM E-1745 Class B minimum conforming vapor retarder placed in accordance with ACI 302-2001 and directly in contact with the concrete placement.
2. If there is no vapor retarder or the presence of a vapor barrier is unknown, product may be installed if testing is done per the latest edition of ASTM F2170, as described in the Milliken Non-Reactive Standard Adhesive product specifications and Milliken's then current published instructions for installation of modular carpet, and the moisture levels do not exceed 95% relative humidity as measured by the in situ relative humidity probe test.
3. If the concrete slab is experiencing hydrostatic pressure, or the slab surface is visibly wet, the slab should be treated by some other method and is not covered by this warranty. Failures include, but are not limited to, the following:
 - a. Milliken does not warrant against hydrostatic pressure, instances where water is forcibly pushed into the slab and/or moisture events caused by broken pipes. In such cases the warranty will be voided.
4. Warranty Period: Lifetime
 - a. "Lifetime" is defined as the period of time that the original purchaser of the original carpet installed with the adhesive product chooses to keep the carpet on the floor at the original installation site. Lifetime warranties only apply to adhesive product purchased after November 4, 2016.
5. Validation
 - a. The warranty only applies to use of the Milliken Non-Reactive Standard Adhesive product in carpet installations when bond testing, substrate preparation, adhesive application and carpet installation have all be performed in accordance with the requirements and instructions set forth on the product label, the product specification sheet, Milliken's then current published instructions for installation of modular carpet (which are specific for each carpet product), and the then current Carpet and Rug Institute publication CRI 104 (collectively, the "Documentation"). Furthermore, the carpet installation must be in an indoor commercial environment. The warranty shall not apply to:
 - 1) Installations on substrates that were not prepared as instructed in the Documentation;
 - 2) Installations where silicates or other sealers or curing additives have been used on the substrate;
 - 3) Installations over substrates where hydrostatic pressure exists;

- 4) When the claimant does not have written and photographic documentation of the bond testing conducted prior to the installation;
- 5) Installation failures due to outside sources of water;
- 6) Installations taken up or replaced prior to inspection by authorized Milliken personnel;
- 7) Installations with chemically cleaned substrates, where improper cleaning methods have been used, or where adhesive removed have been applied;
- 8) Installations using incompatible curing compounds, mold release agents, or non-Portland cement based leveling or patch compounds;
- 9) Failure of leveling or patch compounds of any kind;
- 10) Damage caused by expansion joints or other structural areas;
- 11) Structural failure, seismic action, discoloration, caustic solutions entering the system topically through joints;
- 12) Where the adhesive product was allowed to freeze prior to use. In no event shall Milliken be liable for incidental or consequential damages, whether in contract, warranty, negligence, strict liability, or otherwise.

PRODUCTS

1.12 MANUFACTURER

A. Milliken, Comfort Plus® Cushion Back Carpet Tile; Standard color from the ELEVATION True North collection. COLOR SECTIONS TO BE MADE UPON SUBMITTAL. Pattern as shown on the drawings. Size – 9.84” x 39.4”.

1. COLOR SECTIONS TO BE MADE UPON SUBMITTAL.
2. Primary Backing: Nonwoven
3. Secondary Backing: PVC-free backing, open-celled polyurethane cushion

B. Milliken, ES Underscore™ Cushion Back Carpet Tile

1. Primary Backing: Nonwoven
2. Secondary Backing: PVC-free backing, open-celled polyurethane cushion

1.13 NON REACTIVE STANDARD ADHESIVE

A. Manufacturer: Milliken

B. Packaging: 4-gallon pail with pour spout or 15.1L size

C. Weight per Gallon: 8.5 lbs. per gallon +/- 0.25 lbs.

D. Base: Acrylic Emulsion

E. Color:

1. Wet: Mint Green
2. Dry: Maintains a green tint—this change is one of the adhesive film indicators

F. Solids: 58% by weight minimum

G. Consistency: Thin syrup

- H. Solvent: No; water-based
- I. Storage: Adhesive must be stored between 40° and 100°F; protect from freezing
- J. On Site: Carpet, adhesive, and area must be conditioned to between 60° and 90°F 24 hours before, during, and after installation.
- K. Flammability: Non-flammable in wet state
- L. Shelf Life: Two year stored in original container tightly sealed
- M. Set-up Time: Varies with humidity temperature and air velocity
- N. Bonding Duration: Indefinite when kept clean
- O. Clean-up from Carpet: Water when still wet – safety solvent when dry

1.14 INSTALLATION ACCESSORIES

- A. Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Milliken Non-Reactive Standard Adhesive
- C. Milliken Non-Reactive Standard Adhesive is applied with a ¾ to 1” nap paint roller or a 1/32” x 1/32” x 1/16” notched trowel.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and installation tolerances.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 “Cast-in-Place Concrete” and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. All topical membrane forming concrete curing compounds must be removed.
 - 2. Concrete subfloor must be structurally sound, clean, smooth, trowel finish (not burnished) and level. Cracks and holes in excess of 1/8" (3.2mm) should be filled with a Portland Cement based floor patching material such as W.W. Henry 547 Unipro™, DAP “Wecrete 98”, Maipei “PlaniPatch”, Ardex “Featherfinish” or similar. Gypsum based compounds are not recommended.
 - 3. The only physical requirement for existing adhesive films is that they be scraped clean and dry. If additional smoothing is required and residual adhesive is black (cutback or asphalt

emulsion) smoothing must be accomplished by applying a very thin layer of one of the above patching compounds.

4. If residual adhesive is not black, scrape or sand until smooth and non-tacky as required.
5. Protruding objects must be removed. Floor must be flat (not undulating) to within 1/4" in 12' (6.4mm across 3.66m) with no abrupt changes.
6. Durabond D250 is a recommended product should this type of treatment be deemed necessary; however, any non-silicone based sealer will work acceptably with non-PVC backings. This treatment is NOT intended to be a corrective for out of specification water vapor transmission levels.
7. When working with a Gyp-Crete or Gypsum subfloor, Milliken recommends sealing with a gypsum floor sealer prior to installation. Failure to do so will result in an unacceptable installation. Gyplock Sealer by Cornerstone Coatings International Inc. is a suitable sealant.

2.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

2.3 INSTALLATION

- A. Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Coverage rates for Comfort Plus and Underscore cushionback full spread for all tile sizes: 35-40 sq. yards per gallon (9.5-10 sq. meters per liter).
- G. In extreme environments, such as casinos and convention centers, which will routinely experience rolling loads in excess of 5,000 lbs., a heavier full spread of adhesive is recommended. Target coverage for this end use is 20-25 sq. yards per gallon (5-6 sq. meters per liter) for the Non-Reactive Standard product.
- H. ADHESIVE READINESS SHOULD BE VERIFIED AS FOLLOWS BEFORE BEGINNING INSTALLATION.

1. A bond test is a mock-up installation done prior to the general installation of the Modular Carpet tile to indicate whether the adhesive will bond satisfactorily to the substrate and floor covering. Bond testing will aid in identifying both the working characteristics of the adhesive, such as the appropriate open and working time for the site conditions, and also any potential bonding problems to the substrate.

I. Bond Test Procedure:

- a. Select an approximately 7-foot square area (4 square meters) in a typical location on the substrate or slab. The floor should be prepped and consistent with the installation plan per Milliken Modular carpet installation instructions.
- b. Milliken modular carpet adhesives should be applied to the substrate for a releasable installation in the recommended manner (trowel, roller, or aerosol spray) and application rate. The adhesive should be allowed to dry completely prior to installation of modular carpet.
- c. Observe the adhesive drying time, which will vary with the floor porosity and ambient conditions. Properly dried adhesive will not transfer to the finger and will have a tacky feel.
- d. After placing the carpet tile on the dried adhesive apply downward pressure to assure contact with the substrate. Tiles should be immediately locked in place inhibiting lateral movement.
- e. After 24 hours, observe the mock-up installation to see if any obvious problems may exist. The modular carpet should be adequately bonded to the substrate, and inhibit lateral movement with adhesive remaining firmly bonded to the substrate. To test this attempt to slide each tile. Now lift each carpet tile and check backing for adhesive transfer. All adhesive should remain on the floor. There should be no adhesive transfer to the back of the tile.
- f. Document with photos that show floor prep, floor with adhesive, and back of tile upon tile removal after 24hr period.
- g. Testing should be conducted approximately 72 hrs prior to installation.
- h. If installation covers multiple floors a bond test should be conducted on grade.

2.4 PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

SECTION 09 90 00

PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Surface Preparation.
- B. Surface Finish Schedule – Contractor to provide field and accent colors as shown on the finish schedule.

1.3 RELATED SECTIONS

- A. Section 08100 – Hollow Metal Frames.
- B. Section 09260 - Gypsum Board Systems.

1.4 REFERENCES

- A. ANSI/ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.
- C. SSPC - SP1 - Solvent Cleaning
- D. SSPC - SP2 - Hand Tool Cleaning

1.5 DEFINITIONS

- A. Conform to ANSI/ASTM D16 for interpretation of terms used in this section.

1.6 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.
- B. Applicator: Company specializing in commercial painting and finishing with three years documented experience.
- C. Flame Spread: Interior finishes must meet Class II flame spread, 26-75 index, or less.

1.7 SUBMITTALS

- A. Provide product data on all finishing products.
- B. Submit samples under provisions of Section 01300.
- C. Submit two samples 6 x 6 inch in size illustrating range of colors and textures available for each surface finishing product scheduled, after color selection.
- D. Submit manufacturer's application instructions under provisions of Section 01300.
- E. Certify that material installed on this project does not contain insecticide, mildewcide, and no more than 0.06 percent lead.

1.8 FIELD SAMPLES

- A. Provide one field sample panel, 12 inches long by 12 inches wide, illustrating special texture, and finish for each color selected.
- B. Accepted sample may not remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.
- C. Deliver products to site in sealed and labelled containers; inspect to verify acceptance.
- D. Container labelling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- E. Store paint materials at minimum ambient temperature of 45° F and a maximum of 90° F, in well ventilated area, unless required otherwise by manufacturer's instructions.
- F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 55° F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 55° F for interiors; 65° F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish Finishes: 65° F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 50 foot-candles measured mid-height at substrate surface.

1.11 EXTRA STOCK

- A. Provide two gallon containers of each color and surface texture to owner.
- B. Label each container with color, texture, and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – PAINT

- A. Kelly-Moore Paint Co., Inc.
- B. Sherwin Williams Company.
- C. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

- A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- B. Coatings: Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners, and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.3 FINISHES

- A. Refer to schedule at end of section for surface finish schedule.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Report any condition that may potentially affect proper application.
 - 1. Plaster and Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
 - 3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
 - 4. Exterior Located Wood: 12 percent, measured in accordance with ASTM D2016.
- D. Beginning of installation means acceptance of existing surfaces.

3.2 PREPARATION

- A. At existing exterior glazed finish- pressure wash all existing flaking paint from existing surface.
- B. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
- C. Correct minor defects and clean surfaces which affect work of this section.

- D. Shellac and seal marks which may bleed through surface finishes.
- E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.
- G. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- H. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to completely and thoroughly dry.
- I. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- J. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- K. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.
- L. Interior Wood Items Scheduled to Receive Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- M. Concrete Paving Scheduled to Receive Paint Finish: Remove foreign particles to permit adhesion of finishing materials.
- N. Hollow Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.3 PROTECTION

- A. Protect elements surrounding the work of this section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this section.
- C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

3.4 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.

- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Prime back surfaces of interior and exterior woodwork with primer paint.
- I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.
- J. Apply new paint as specified on new and renovated existing surfaces. The entire renovated surface shall be painted, not just the repaired portion. Renovated surfaces shall be painted from floor to ceiling, corner to corner, or break in surface plane.
- K. Repainting the entire surface (new, renovated, or existing): shall be required if the surface is damaged by construction activities. The architect will make the final determination.

3.5 PERMANENT MARKING AND IDENTIFICATION OF FIRE WALLS

- A. Permanently identify with red stenciled 3-inch high lettering all fire rated walls. Identification to be located on the fire-rated wall/partition above ceilings and at exposed areas (such as Mechanical and Electrical Equipment Rooms), on 10-foot intervals and as high as possible and still visible from the finished floor and include the wording "FIRE WALL". Areas of fire-rated walls/partitions exposed to viewing by the public shall be exempt from stenciling.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to Section 15 and Section 16 for schedule of color coding and identification banding of equipment, ductwork, piping and conduit.
- B. Paint shop primed equipment.
- C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.
- D. Replace identification markings on mechanical or electrical equipment when painted accidentally.
- E. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, and grilles, to match face panels.
- F. Paint exposed conduit and electrical equipment occurring in finished areas.
- G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- H. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated. Color band and identify as required.
- I. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.7 CLEANING

- A. As work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.8 SCHEDULE OF PAINTING

- A. The kinds and brands of paint and number of coats required on the various surfaces shall be those listed below. The types of paint are identified with Pittsburg Paint or Sherwin Williams numbers.
- B. The owner and architect shall select color, tint, and sheen from manufacturer's standard color chart.
- C. Exterior Existing glazed tile
 - 1. First Coat: XIM Advanced Technology UMA® Brand White
 - 2. Second Coat: PPG Sun Proof Exterior 100% Acrylic Latex Satin 76-45XI Series
 - 3. Second Coat: PPG Sun Proof Exterior 100% Acrylic Latex Satin 76-45XI Series
- D. Beneath wall graphics or applied wall finishes
 - 1. First Coat: PPG 6-2 Speedhide interior Latex primer sealer
 - a. Ensure compatibility with applied finish prior to installation
- E. Exterior and Interior Metal:
 - 1. First Coat: PPG 6-208 Series Speedhide steel primer
 - 2. Second Coat: PPG 7-282 Series Industrial Gloss Alkyd enamel
 - 3. Third Coat: PPG 7-282 Series Industrial Gloss Alkyd enamel
- F. Gypsum Board Walls and Ceilings
 - 1. First Coat: PPG 6-2 Speedhide interior Latex primer sealer
 - 2. Second Coat: PPG 6-510 Speedhide interior semi-gloss Latex enamel
 - 3. Third Coat: PPG 6-510 Speedhide interior semi-gloss Latex enamel
- G. Galvanized Metal
 - 1. First Coat: PPG 90-712 series Pitt-Tech Industrial DTM primer/finish enamel
 - 2. Second Coat: PPG 7-282 Series Industrial gloss Alkyd enamel
 - 3. Third Coat: PPG 7-282 Series Industrial gloss Alkyd enamel
- H. Concrete and Asphalt Pavement
 - 1. First Coat: PPG 11-3 Series flat Alkyd zone marking paint.
 - 2. Second Coat: PPG 11-3 Series flat Alkyd zone marking paint.
Accessible parking zones to receive a second coat.
- I. Concrete Unit Masonry
 - 1. First Coat: PPG 6-7 Speedhide Latex masonry block filler.
 - 2. Second Coat: PPG 6-2045 Series Speedhide exterior satin Acrylic Latex.
 - 3. Third Coat: PPG 6-2045 Series Speedhide exterior satin Acrylic Latex.

- J. Concrete Walks
 - 1. First Coat: PPG 11-25 flat Traffic & Zone Marking Paint
- END OF SECTION

SECTION 10 11 16

MARKERBOARDS AND TACKBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Metal surfaced markerboards.
- B. Tackboards and tackable surface.

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

- A. Furnish special concealed supports to Section 06100 - Rough Carpentry for installation in wall construction.

1.4 REFERENCES

- A. ANSI A208.1 - Mat Formed Wood Particleboard.
- B. ANSI/ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
- C. APA - American Plywood Association.
- D. ASTM A424 - Steel Sheets for Porcelain Enameling.
- E. ASTM B209 - Aluminum-Alloy Sheet and Plate.
- F. ASTM C36 - Gypsum Wallboard.
- G. ASTM C208 - Insulation Board (Cellulose Fiber) Structural and Decorative.
- H. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
- I. FS LLL-B-810 - Building Board, (Hardboard) Hard Pressed, Vegetable Fiber.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for fame/fuel/smoke ratings for markerboards and tackboards in accordance with ASTM E84.

1.6 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Indicate on shop drawings, wall elevations, dimensions, joint locations special anchor details.
- C. Provide product data on markerboards, tackboards and trim and accessories.

D. Submit samples illustrating materials and finish, color, and texture of markerboard and trim tackboard surfacing.

E. Submit manufacturer's installation instructions under provisions of Section 01300.

1.7 MAINTENANCE DATA

A. Included maintenance information on regular cleaning and stain removal.

1.8 WARRANTY

A. Warranty: Include coverage of markerboard surface from discoloration due to cleaning, crazing, cracking or staining.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Claridge Products & Equipment, Inc.

B. Greensteel Division.

C. Best-Rite.

D. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

A. Steel Sheet: ASTM A424, Type I, 24 gage commercial quality equal to Claridge, 800 series #40 DLC white with map rail and marker trough.

B. Aluminum Extrusions: ANSI/ASTM B221, 6061 alloy.

C. Cork: Fine grain natural cork, homogeneous composition.

D. Hardboard: FS LLL-B-810; tempered, smooth face.

E. Foil Backing: Aluminum foil sheet .002 inch thick.

F. Tackboard Covering: Equal to Claridge colored Nucork.

G. Adhesives: Type recommended by manufacturer.

2.3 ACCESSORIES

A. Provide 10 assorted markers and 2 erasers for each markerboard.

B. Provide 4 round magnets per workboard.

2.4 FABRICATION – MARKERBOARD

A. Outer Face Sheet: Steel 24 gage thick.

- B. Core: Hardboard; Fiberboard; Gypsum board; 3/16 inch thick.
- C. Backing surface: 0.002 Aluminum foil, inch thick.

2.5 FABRICATION – TACKBOARDS

- A. Outer Facing: Cork, 1/4 inch thick.
- B. Core: Hardboard 3/16 inch thick.
- C. Backing Surface: Aluminum foil, 0.002 inch thick.

2.6 FRAME AND TRIM

- A. Frame: Extruded aluminum, concealed fasteners; map rail with cork insert over markerboard surfaces.
- B. Chalkrail: Extruded aluminum, profile; one piece, full length of markerboard; concealed fasteners.

2.7 FINISHES

- A. Enamel: Surface over steel, baked white surface over steel over hardboard.
- B. Tackboard Surface: Color as selected from manufacturer's standard range.
- C. Aluminum Frame and Accessories: Mill finish natural aluminum.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that surfaces and internal wall blocking are ready to receive work, and opening dimensions are as instructed by the manufacturer.
- B. Beginning of installation means acceptance of substrate construction.

3.2 INSTALLATION

- A. Install markerboards and tackboards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.
- C. Butt markerboard panels to tackboards tight with concealed spline to hairline joint.

3.3 CLEANING

- A. Clean markerboard surfaces in accordance with manufacturer's instructions.
- B. Cover markerboard and tackboard surfaces with protective cover, taped to frame.
- C. Remove protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 14 23

SIGNS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Interior wall mounted plastic signs.
- B. Custom Printed Vinyl wall and window Graphics

1.3 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications.
- B. Section 09900 - Painting.

1.4 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Submit letter style and colors for selection.

1.5 WARRANTY

- A. Provide a minimum of 30 months on electronics and 12 months on bulbs.
- B. Submit according to Section 01300.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

Signmojo.com or equal.

MATERIAL - PLASTIC SIGNS

- A. Opera Series.
- B. Flexible blended acrylic extruded sheet.
- C. Layers permanently bonded together.
- D. Satin finish.
- E. Colors to be selected from manufacturer's standard colors.
- F. Letter style - Optima.
- G. Foam tape mounting to wall according to Texas Accessibility Standards.

2.2 CUSTOM PRINT VINYL SIGNS

- A. Digitally printed custom graphics provided by architect.

Installation on wall and window – refer to drawing.

2.3 FABRICATION - PLASTIC SIGNS

- A. Sign to not less than two inch high by required length to provide uniform margin.
- B. Handicap emblem to be square with radius corners.
- C. Text and emblems to be raised from background, also provide text in braille message format.

PART 3 EXECUTION

3.1 MOUNTING - PLASTIC SIGNS

- A. Signs are to be set level to the floor.
- D. Window installation to be provided with blank back for adhesive tape concealment.
- B. Refer to drawings for installation location.

3.2 CLEANING

- A. Clean signs and adjacent surfaces of any adhesive residue, mastic, concrete, mortar, etc.
- B. Protect signs from damage until substantial completion is accomplished and accepted by the Architect.
- C. Remove all protective covers, wrappings, or tape prior to substantial completion.

3.3 SCHEDULE - PLASTIC SIGNS

- A. Contractor to provide and install the following FINAL SCHEDULE AND TEXT TO BE APPROVED UPON SUBMITTAL:
 - 1. 5 ea Unisex Toilet signs HC
 - 2. Two line room signs with inserts
 - a. Office (8 EA)
 - 3. Two line room signs
 - a. Electrical
 - b. Storage (3EA)
 - c. Classroom
 - d. Conference (2EA)
 - e. Break Room
 - f. Tele Therapy
 - g. 5 EA miscellaneous

END OF SECTION

SECTION 10264

BULLET RESISTANT PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, and Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Bullet Resistant Fiberglass Panels

1.3 RELATED SECTIONS

- A. Section 09260 – Gypsum Board Systems.
- B. Section 09900 - Painting.

1.4 REFERENCES

- A. American Society for Testing and Materials:
 - 1. ASTM E119-98 Standard Test for One-Hour Fire-Rating of Building Construction and Materials
 - 2. ASTM F1233-98 Standard Test Method for Forced Entry Testing of Materials/Assemblies, Body passage requirement, Class IV
- B. International Organization for Standardization:
 - 1. ISO 9001: 2008 Quality Management System
- C. National Institute of Justice Ballistic Standards
 - 1. NIJ Standard 0108.01 – Type III-A
- D. Small Business Administration
 - 1. SBA Small Business Size Standard
- E. Underwriters Laboratories:
 - 1. UL 752 Specifications and Ammunition, 11th Edition, Standard for Bullet Resisting Equipment published September 9, 2005, revised December 21, 2006, Level 3
- F. The United States Department of State:
 - 1. The International Traffic in Arms Regulations (ITAR)

1.5 SUBMITTALS

- A. Provide product data on Bullet Resistant Panels. Include, specifications, brochures, samples, and recommendations for installation.
- B. Submit printed data to indicate compliance with the following requirements:

1. UL Listing Verification and UL752 Current Test Results as provided by Underwriters Laboratories
2. ASTM E119-98 One Hour fire Rating of Building Construction and Materials
3. ASTM F1233-98 Standard Test Method for Forced Entry Testing of Materials/Assemblies.
4. Manufacturer's third party certificate of registration with ISO 9001:2008.
5. Manufacturer's U.S. Dept. of State ITAR Statement of Registration.
6. Manufacturer's SBA Profile verifying small business status by the SBA.

1.6 DELIVERY AND STORAGE

- A. Deliver materials to project with manufacturer's UL LISTED Labels intact and legible.
- B. Handle material with care to prevent damage. Store materials inside under cover, stack flat and off the floor

1.7 WARRANTY

- A. Warrant all materials and workmanship against defects for a period of ten (10) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Design Basis: ArmorCore by Waco Composites (Waco, TX 76710, ph: 254.752.3622)
- B. Substitutions: Under Provisions of Section 01600

2.2 PERFORMANCE CRITERIA

- A. Bullet Resistant Fiberglass Panels shall be "non-ricochet type" to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.
- B. Panel Rating: UL752 Level 3
- C. Bullet resistance of joints: Equal to that of the panel.

2.3 MATERIALS

- A. Panels fabricated of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets.
- B. Thickness: 7/16" nominal thickness
- C. Nominal Weight: 4.8 lbs. per sq. ft.
- D. Available Panel Sizes: [3' x 8'] [3' x 9'] [3' x 10'] [4' x 8'] [4' x 9'] [4' x 10'] [5' x 8'] [5' x 9'] [5' x 10'] [Custom]
- E. Panels manufactured in the United States of America with raw materials sourced from the U.S.A. for quality assurance purposes and to comply with any applicable "Buy American" Provisions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to starting installation, verify work of related trades required in contract documents and architectural drawings is complete to the point where work of this section may properly commence

3.2 JOINTS

- A. Reinforce joints with a back-up layer of bullet resistant material. Minimum width of reinforcing layer at joint shall be 4-inches, centered on panel joints.

3.3 APPLICATION

- A. Install armor in accordance with manufacturer's recommendations and as required by contract documents
- B. Secure armor panels using screws, bolts, or an industrial adhesive.
 - 1. Method of application shall install panels minimizing vulnerabilities by fitting tightly to adjacent surfaces including concrete floor slab, roof structure, bullet resistive door frames, bullet resistive window frames, and the like.

END OF SECTION

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 SECTION INCLUDES

- A. Toilet accessories.
- B. Attachment hardware.

1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 09260 - Gypsum Board Systems: Installation of backing plate reinforcement.

1.4 RELATED SECTIONS

- A. Section 09260 - Gypsum Board Systems: In wall framing and plate for support of accessories.

1.5 REFERENCES

- A. ANSI A117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.
- B. ANSI/ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates Bars and Strips.
- C. ANSI/ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
- D. ANSI/ASTM A386 - Zinc Coating (Hot-dip) on Assembled Steel Products.
- E. ANSI/ASTM B456 - Electrodeposited Coatings of Copper plus Nickel plus Chromium and Nickel plus Chromium.
- F. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- G. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- H. NEMA LD-3 - High Pressure Decorative Laminates.

1.6 SUBMITTALS

- A. Provide product data on accessories describing size, finish, details of function, attachment methods.
- B. Submit manufacturer's installation instructions under provisions of Section 01300.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for installing work in conformance with ANSI A117.1.
- B. Comply with the latest adopted version of the Texas Accessibility Standards (TAS) and Americans with Disabilities Act (ADA).

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this section with the placement of internal wall reinforcement.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. McKinney/Parker Washroom Accessories
- B. The Bobrick Company
- C. Bradley Corporation
- D. Substitutions: Under provisions of Section 01600.

2.2 MATERIALS

- A. Sheet Steel: ANSI/ASTM A366.
- B. Stainless Steel Sheet: ASTM A167, Type 304.
- C. Tubing: ASTM A269, stainless steel.
- D. Adhesive: Contact type, waterproof.
- E. Fasteners, Screws, and Bolts: Hot dip galvanized tamperproof.
- F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.
- G. Wall Grounds: Provide concealed grounds of 9 gage metal plates or fire resistant 2x wood blocking.

2.3 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from single sheet of stock, free of joints.
- C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.
- E. Shop assemble components and package complete with anchors and fittings.
- F. Provide steel anchor plates, adapters, and anchor components for installation.
- G. Hot dip galvanize exposed and painted ferrous metal and fastening devices.
- H. Concealed grounds shall be at least 9 gage metal or 2 x 6 wood.

2.4 FACTORY FINISHING

- A. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- B. Stainless Steel: 18 gauge type 304 satin finish.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and dimensions as instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Beginning of installation means acceptance of existing conditions.

3.3 INSTALLATION

- A. Install fixtures, accessories and items in accordance with manufacturer's instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Concealed grounds are to be securely anchored to partition framing.
- D. Installed grab bars must be able to support a steady force of 250 pounds.

3.4 ACCESSORY LOCATIONS

- A. In toilet rooms where only one sink is provided, provide a handicap accessible mirror. In toilet rooms where more than one sink is provided, provide one handicap accessible mirror above the accessible sink and one mirror above each of the non accessible sinks.
- B. Comply with the latest adopted version of the Texas Accessibility Standards, Chapter 4, location and mounting heights criteria.

3.5 TOILET ACCESSORY SCHEDULE

A. Grab Bars	Bobrick B-6806.99 x 36, B6806.99 x 42, B68137, B-6861 2561 Series Anchor Plate
B. Mirrors	B-290 18 x 36
C. Toilet Tissue Dispensers	Owner Provided Contractor Installed
D. Soap Dispenser	Owner Provided Contractor Installed
E. Paper Towel Dispensers	Owner Provided Contractor Installed

F. Sanitary Napkin Disposal

B-270 1 per toilet room

G. Trash receptacles

B3644 12 Gallon Recessed Bathroom Trash Can

END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cutout dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half sized.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
- B. Cutout Characters :Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles; and as follows:
 - 1. Character Material: Sheet or plate aluminum.
 - 2. Character Height: 4"
 - 3. Thickness: Manufacturer's standard for size of character
 - 4. Finishes:
 - a. Brushed aluminum - 902
 - b. Overcoat: Manufacturer's standard baked-on clear coating.
 - 5. Mounting: Projecting studs 1".

2.2 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 4. Sign Mounting Fasteners:
 - a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Adhesive: As recommended by sign manufacturer.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.3 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.

3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
5. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 10419

SECTION 10 44 43

FIRE EXTINGUISHERS AND CABINETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The Drawings, General Conditions, Supplementary General Conditions apply to the work of this Section.

1.2 WORK INCLUDED

- A. Fire extinguishers.
- B. Cabinets.
- C. Accessories.

1.3 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry.
- B. Section 09260 - Gypsum Board Systems.

1.4 REFERENCES

- A. NFPA 10 - Portable Fire Extinguishers.
- B. Underwriters Laboratories, Inc. Directory.

1.5 QUALITY ASSURANCE

- A. Conform to NFPA 10 - Requirements for Extinguishers.
- B. Underwriters Laboratories, Inc. for rated assemblies.

1.6 SUBMITTALS

- A. Submit product data under provisions of Section 01300.
- B. Include physical dimensions, fire rating, operational features, color and details.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit manufacturer's operation and maintenance data under provisions of Section 01700.
- B. Included test, refill or recharge schedules, procedures and re-certification requirements.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install extinguishers when ambient temperatures may cause freezing.
- B. Install extinguishers only after the interior temperatures are controlled.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- A. J.L. Industries.
- B. Larsons Fire Protection & Safety Equipment.
- C. Modern Metal Products by Muckle.

2.2 EXTINGUISHERS

- A. Multi-Purpose Dry Chemical Type: Steel tank, Model Cosmic 10E manufactured by J.L. Industries, with pressure gauge, UL rated 4A-60BC.

2.3 CABINETS

- A. Cabinet: J.L. Industries Ambassador model 1817 Fire-FX, formed sheet steel, 18 gauge primed, semi-recessed type, tub inside dimensions of 10 1/2 x 24 x 5 1/2 inches. Electrostatic white epoxy finish.
- B. Trim: 3" Rolled Trim
- C. Door: Full Glazing in 1-1/4" wide frame
- D. Glass: 1/4 inch clear tempered glass.
- E. Mounting Hardware: Appropriate to cabinet.
- F. Fire Rated: Assembly must maintain fire rating of partition in which installed.

2.4 FABRICATION

- A. Form body of cabinet with tight inside corners and seams.
- B. Predrill holes for anchorage.
- C. Form perimeter trim (and door stiles) by welding, filling and grinding smooth.
- D. Hinge doors for a 180 degree opening with continuous piano hinge.

2.5 FINISHES

- A. Extinguisher: White enamel.
- B. Cabinet Trim and Door: White Powder coat paint finish.
- C. Cabinet Interior: White enamel.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify rough openings for cabinet are correctly sized and located.
- B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Install cabinets plumb and level in wall openings where shown on the drawings.
- B. Secure rigidly in place in accordance with manufacturer's instructions.
- C. Install cabinets so cabinet door handle is 48 inches above finished floor according to Texas Accessibility Standards.

END OF SECTION

SECTION 12 24 10
ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes manually operated roller shades.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Draper Inc.
 2. Hunter Douglas Contract.
 3. Qmotion Shades.ROLLER SHADES
- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Bead Chains: Manufacturer's standard.
 - a. Loop Length: Full length of roller shade.
 - b. Limit Stops: Provide upper and lower ball stops.
 - c. Chain-Retainer Type: Chain tensioner, jamb mounted.
 2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
 - a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criteria are more stringent.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Mounting Configuration: Single roller.
 2. Roller Drive-End Location: Right side of inside face of shade.
 3. Direction of Shadeband Roll: Regular, from back of roller.
 4. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:

1. Shadeband Material: Light-filtering fabric.
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Color and Finish: As selected by Architect from manufacturer's full range.
- G. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches (102 mm).
 2. Endcap Covers: To cover exposed endcaps.
 - a. Closure-Panel Width: 2 inches (51 mm).

2.2 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 1. Source: Roller-shade manufacturer.
 2. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
 3. Weave: Basketweave.
 4. Roll Width: 48 inches (1229 mm).
 5. Orientation on Shadeband: Up the bolt.
 6. Openness Factor: 5 percent.
 7. Color: As selected by Architect from manufacturer's full range.
 8. Orientation on Shadeband: Up the bolt.
 9. Features: Washable Antistatic treatment.

2.3 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 ROLLER-SHADE INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install roller shades level, plumb, and aligned with adjacent units, according to manufacturer's written instructions.
- D. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- E. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

END OF SECTION

CONSULTANTS' PROFESSIONAL RESPONSIBILITY

The specifications sections to be authenticated by my seal and signature are limited to the following:

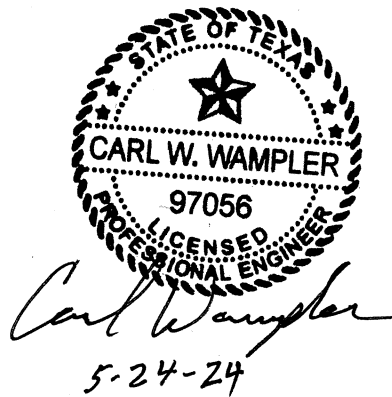
DIVISION 15 - MECHANICAL

15010	GENERAL MECHANICAL PROVISIONS	8
15020	TESTING	2
15060	PIPING	4
15250	INSULATION	2
15500	AUTOMATIC FIRE PROTECTION SYSTEM	4
15650	AIR CONDITIONING	3
15804	VENTILATING	1
15840	DUCTWORK	3
15870	GRILLES, REGISTERS AND CEILING DIFFUSERS	1

END OF TABLE OF CONTENTS

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SECTION 15010 - GENERAL MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specifications includes the furnishing of all materials and labor as required for the installation of the plumbing, heating, ventilating and air conditioning systems, all as shown on the drawings, as herein specified, or both.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. This Contractor shall submit six (6) copies of all submittal data covering proposed equipment to the Architect for approval prior to installation. All equipment shall be submitted at one time in a bound folder with an index of submittal.

1.4 REGULATIONS

- A. All work shall be done in strict accordance and compliance with State and Local Laws, together with regulations of the particular Utility Companies concerned.
- B. Obtain permits as required by the local authorities.

1.5 CLARIFICATION

- A. The Engineer shall provide, with reasonable promptness, written responses to requests from the Contractor for clarification and interpretation of the requirements of the Contract Documents. However, if the Contractor's requests for information, clarification or interpretation are, in the Engineers professional opinion, for information readily apparent from reasonable observation of field conditions or a review of the Contract Documents, or are reasonably inferable therefrom, the Engineer shall be entitled to compensation from the Contractor for the Engineer's time spent responding to such requests.

1.6 DEFECTS

- A. Contractors shall promptly report to the Engineer any defects or suspected defects in the contract documents of which the Contractor becomes aware, so that the Engineer may take measures to minimize the consequences of such a defect. Failure by the Contractor to notify the Engineer shall relieve the Engineer or Owner of the costs of remedying the defects above the sum such remedy would have cost had prompt notification been given when such defects were first discovered.

1.7 COMPLETION

- A. If the Contractor asks for a final inspection and the project is not complete enough to prepare a normal punch

list as determined by the Engineer, the Engineer shall be compensated for time and travel for subsequent site visits.

1.8 DRAWINGS

- A. The drawings and the specifications are numbered consecutively. Each Contractor shall check these drawings and specifications thoroughly and shall notify the Architect of any discrepancies or omissions of sheets or pages. Upon notification, the Architect will promptly provide the Contractor with any missing portions of the drawings and/or specifications. No discrepancies or omissions of sheets or pages of the Contract Documents will relieve the Contractor of his duty to provide all work required by the complete Contract.
- B. The plans accompanying these specifications are intended to show the general arrangement and the extent of the work contemplated. The Contractor shall inspect the site before bidding to verify the actual conditions involved as no allowance will be made for unforeseen conditions. The exact location and arrangement of all parts shall be determined after equipment has been approved by the Architect and as directed by the Architect. All materials or labor necessary to complete the work in accordance with the intent of these specifications shall be furnished by each Contractor without additional charge as if called for in these specifications or shown on the plans.
- C. Should the particular equipment which any bidder proposes to install require other space conditions, supports or clearances other than those indicated on the drawings, he shall arrange for such items with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.
- D. This Contractor shall verify all existing conditions that may effect his work including exact location and size of all plumbing lines, direction of flow, ductwork, existing equipment and connection points. Any discrepancies from conditions shown on the drawings shall be reported to the Architect before bidding and the bid price shall include the cost to correct any discrepancies to provide a complete and workable system.
- E. This Contractor shall thoroughly lay out all his work and check all conditions to insure that the work as shown on the Drawings can be installed without modifications. No material shall be fabricated or delivered to the job until these conditions have been determined.
- F. The Owner or Owner's Representative reserves the right to make changes during construction, if required, and no allowances will be made for prefabricated material or on job materials which can not be used due to actual conditions.

1.9 APPROVAL OF MATERIALS

- A. Where manufacturer's names are mentioned in these specifications, it has been done, in most cases, in order to establish a standard. The products of others than the particular manufacturers mentioned will be acceptable, if of suitable type and construction, but any substitution must be of quality as good as, or better than, the named article.
- B. If the Contractor elects to substitute other equipment or materials for that specified by name, he shall be fully responsible for all coordination with other trades involved. Any expense incurred because of modifications to accommodate larger sizes, larger electrical service, fuel piping requirements resulting from such substitution shall be borne by the Contractor substituting other equipment.
- C. Upon being awarded the Contract for the work under one of the following sections, the Contractor shall, within thirty (30) days, submit for approval a complete list of the materials which he proposes to use. The list shall give the manufacturer's names and designations corresponding to every item and where submitted materials are different from that specified by name, the submission shall be accompanied by a complete descriptive literature and/or any supplementary data and drawings, necessary to give full and complete details for the completed installation.

- D. Any item on this list which is rejected because of unsuitability or inferior quality, must be replaced by an acceptable item within two (2) weeks following notification of the Contractor of such rejection. If no satisfactory material is submitted within two (2) weeks, then the Architect reserves the right to notify the Contractor as to the type and make of materials he will be required to furnish. Six (6) copies of the material and the equipment list shall be furnished by the Contractor in neat and firmly bound brochures for approval.

1.10 PRECEDENCE

- A. The work covered in this section shall have precedence over each other in accordance with the following sequence:
 - 1. Soil and waste piping
 - 2. Duct work
 - 3. Cold and hot water piping
 - 4. Electric wiring

1.11 COOPERATION

- A. Each contractor shall cooperate with the General Contractor and all other contractors to properly coordinate their work, to avoid interference and delays, and arrange all parts of the work so as to harmonize in service and appearance with all other parts.

1.12 INTERFERENCES

- A. The plans are generally diagrammatic and the Contractor must harmonize the work of the different trades so that interference between piping, equipment, architectural and structural work will be avoided. All necessary offsets in piping, fittings, etc., required to properly install the work must be kept as close as possible to walls, ceiling, columns, etc., so as to take up the minimum amount of space, and all offsets, fittings, etc., required to accomplish it must be furnished and installed by the contractor without additional cost to the Owner.
- B. Exact locations of mechanical equipment may be varied a reasonable amount by the Architect before installation without additional cost to the Owner.
- C. All equipment and controls shall be so located and arranged that all parts will be available for proper maintenance.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

- A. Materials shall be new, unless otherwise specified, and of the quality specified. Materials shall be free from any defects. Materials and equipment for which the Underwriters' Laboratories have established as standard, shall be listed by the Underwriters' Laboratories, Inc., and shall bear their label.
- B. Each Contractor shall be responsible for transportation of his materials to the job and shall be responsible for the storage and protection of same. This will be provided until final acceptance of the job.
- C. Each Contractor shall provide protection against weather, so as to maintain all materials and equipment free from injury and damage. All new work likely to be damaged shall be covered during the day and at the end of each day.

- D. Each Contractor will furnish all necessary scaffolding, tackle, tools, appurtenances and all labor required for the safe and expeditious execution of this contract.
- E. The workmanship shall be in all respects, the highest grade and all construction in accordance with the best practice of the trade.

PART 3 - EXECUTION

3.1 VERIFICATION OF PLANS AND SPECIFICATIONS

- A. It shall be the responsibility of all parties concerned to carefully examine the plans and specifications relating to this work for completeness, accuracy and clarity. Any conflict, errors or clarification requests shall be immediately brought to the attention of the Engineer for written interpretation or instructions. No claims for increased compensation for additions, changes or alterations will be considered unless written authority is granted by the Engineer. Otherwise, any additional materials and/or labor due to additions, alterations and changes necessary to meet existing conditions shall be furnished under this contract.

3.2 HANGERS AND SUPPORTS

- A. The Contractor for the work covered by each section of these specifications shall furnish and install all foundations and supports required by equipment included in his work.
- B. All piping, both vertical and horizontal, shall be supported at sufficient close intervals to keep its alignment, prevent sagging and to prevent pipe from being supported by equipment or equipment connections.
- C. Vertical pipes shall be supported from floor with riser clamps sized to fit the lines and adequately support their weight. Vertical copper tubing, 1-1/4" and smaller shall be supported at 3' intervals and at the base of pipe risers, where required for proper support. Hangers shall be manufactured by Kindorff, Unistrut, Elcen or equal. Where multiple pipes are indicated, they may be supported on a continuous hanger. All hangers must meet the Architect's approval. Use of perforated straps will not be permitted.

- D. All horizontal pipes suspended with structure above shall be supported by hanger rods of the following size:

1. Pipes up to and including 2"	3/8" rods
2. 2-1/2" and 3" pipe	1/2" rods
3. 4" and 5" pipe	5/8" rods
4. 6" pipe	3/4" rods

- E. Soil pipe shall be supported at all turns and at intervals not to exceed 5' on centers on straight runs. The following table gives maximum hanger spacing for copper and steel lines but hangers shall be more closely spaced where necessary:

SIZE OF LINE	HANGER SPACING
3/4" and smaller	5'
1"	6'
1-1/4"	7'
1-1/2"	8'
2" to 4"	10'
Larger than 4"	12'

- F. If pipes of different Contractors can be racked on the same supporting structure, each Contractor shall cooperate with the other involved to properly locate the supporting members and shall furnish a proportionate share of the labor and materials involved in the installation.

3.3 EXPANSION AND CONTRACTION OF PIPES

- A. Swing joints, turns, expansion loops, or long offsets, shall be provided wherever shown on the drawings, and where necessary to allow for the expansion of piping within the building. Broken pipes or fittings due to rigid connection shall be removed and replaced at the Contractor's expense. Anchors shall be installed where shown or required to control expansion of piping system. Anchors shall be of the clamp type securely fastened to the building structure.

3.4 UNIONS

- A. Unions shall not be placed in any pipe in a location which will be inaccessible after completion of the building unless shown on drawings or specified. Unions shall be installed on both sides of all valves, regulators, check valves, traps, etc., so that such equipment may be readily disconnected. Where copper pipe joins iron or steel pipe, an insulation union using a "Bakelite" insulator shall be used.

3.5 ESCUTCHEONS

- A. Where exposed to view, pipes insulated or bare, passing through floors, walls, or ceilings, shall be filled with near, heavy spun or stamped steel escutcheons, firmly secured to the pipes. Escutcheons shall be of sufficient outside diameter to surround both the pipe and the sleeves. The sleeve shall have a nickel plated finish, fabricated in one piece and shall be firmly anchored in space. "Snap-on" type escutcheons will not be permitted.

3.6 SOIL CONDITIONS

- A. This specification and drawings in no way stipulate the condition of the soil to be encountered. When excavation may be required in execution of the work, this Contractor agrees that he has informed himself regarding conditions that may appear or seem to be implied in any portion of the Contract Documents.

3.7 EXCAVATING, TRENCHING AND BACKFILLING FOR PIPING

- A. Trenches for all underground pipe lines shall be excavated 12" beyond required depths. The bottom of trenches shall be tamped hard and graded to secure the required fall. Bell holes shall be excavated so that pipe will rest on solid ground for its entire length. Sewer shall be laid in a separate trench, except where otherwise noted on the drawings. Before backfilling of pipe, Contractor shall provide blow-sand and/or clean river sand in bottom of all trenches, 12" deep.
- B. Backfilling: After pipe lines have been tested, inspected, and approved by the Architect, and prior to backfilling, forms shall be removed, and the excavation shall be cleaned of trash and debris. Backfill shall be placed in horizontal layers not exceeding 8" in thickness, and properly moistened to approximate optimum requirements. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density that will prevent excessive settlement or shrinkage. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage thereof. Blow-sand and/or river sand shall be placed over pipe, 8" minimum, above top of pipe before backfill is begun.
- C. Where gravel, streets, paved streets, sidewalks, etc., are disturbed, cut and damaged in making connections to city sewer, water lines, and gas lines, the expense of repairing same in an approved manner, as required, shall be included under this contract.

3.8 UTILITY CONNECTIONS

- A. Utility connection locations, depths, sizes, characteristics and capacities shall be verified by each Contractor

utilizing these items and any discrepancies from those shown on the plans shall be brought to the Architect's attention before bidding. Any and all utility connections shall be made by the Contractor, as required, with no increase to the Owner above the price indicated in the Contractor's proposal. Provide all necessary backflow prevention devices as required to comply with the City of Lamesa's backflow prevention program.

3.9 PAINTING

- A. No painting will be required under this section.

3.10 TESTING

- A. This contractor shall test all plumbing lines and equipment as described under "Testing" section of these specifications.

3.11 ELECTRICAL

- A. Electric motors shall be of the speed, phase and voltage as specified and shall be of type recommended by motor manufacturer for type of service involved.
- B. The Contractor furnishing the motor shall install it. The Contractor shall furnish such motor controls and starting equipment as specified or as required. The erection and connection of all switches, starting and control equipment, and the wiring of same, shall be done as required. Conduits from controllers to motors shall be flexible for not over three feet (3') and shall be attached to the terminal housing of the motor. All flexible conduit to motor shall be waterproof type with neoprene jacket.
- C. Where automatic controls are called for in the Plumbing, Heating and Air Conditioning specifications, the control instruments, such as motorized damper motors, motorized valves, etc., shall be installed by the Contractor furnishing the controls. All wiring necessary shall be done by the Electrical Contractor. The Contractor furnishing the controls shall furnish a control wiring diagram to the Electrical Contractor.
- D. Starters on air cooled condensing units shall be furnished by the equipment manufacturer. Starters for Heating and Ventilating units shall be furnished by the equipment manufacturer.

3.12 FLASHING

- A. Vent pipes shall be flashed and made watertight at the roof with 4 lb. sheet lead. Flashings shall extend not less than eight inches (8") from the vent pipes in all directions, shall be extended up the vent pipes a minimum of six inches (6") at which point threaded standard cast-iron or malleable-iron recess roof couplings shall be installed to form counter-flashing or rain guards. Flashings in connection with cast-iron pipe vents shall be turned down into the pipes or hubs. Flashings on metal roofs shall be "Dektite" flashings or approved equal. Roof drains shall be flashed as detailed on the drawings.

3.13 PIPE SLEEVES

- A. Each contractor shall provide sleeves for service lines passing through walls, roof or floors, subject to Architect's approval and/or as shown on the Drawings. Pipes passing through interior wall sleeves shall be free to move through sleeve. Sleeves exposed to view shall be equipped with cast brass escutcheons.
- B. All sleeves installed in vertical position shall be constructed of standard weight galvanized steel pipe. All sleeves in horizontal position shall be constructed of standard weight steel or extra heavy cast iron pipe unless otherwise noted, welded to steel plate in vertical position as detailed on the drawings. Pipe sleeve diameter shall be a minimum of 2 diameters larger than the outside of pipe passing through same, and a minimum of 1"

larger than pipe plus insulation. Insulation shall pass through sleeves.

- C. Where pipe extends through exterior walls below grade, oversize pipe sleeves, 2 diameters larger, made of standard weight steel pipe shall be used, and the annular space between service pipe and sleeves shall be filled with picked oakum and cement, or lead where required, to make a waterproof joint.
- D. All sleeves shall be installed flush with finished surfaces and/or as detailed on the Drawings. Copper pipes passing through steel pipe sleeves shall be installed with rubber insulation between pipe and sleeves. Isolator insulation shall be similar to Johns-Manville Aeratube.
- E. Where any pipe passes through fire walls, smoke walls, and concrete slabs between floors, the Contractor shall furnish and install fire seals, U.L. listed, type LS, link-seal, as manufactured by Thunderline Corp., or approved equal. Fire and smoke seals shall be installed in steel pipe sleeve of correct size for pipe and insulation.

3.14 INSULATING COUPLINGS

- A. This Contractor shall furnish and install insulating couplings wherever piping material changes from galvanized steel pipe to copper, or from black steel to copper, and where shown on the drawings.

3.15 INSULATION

- A. Furnish and install pipe, duct, and equipment insulation as specified under "Insulation" section of these specifications.

3.16 LABELS

- A. Mechanical equipment shall have a permanent metal tag or laminated plastic (min. thickness .093 inch) attached by riveting to identify as shown on the drawings. Letters on tag shall be 1/4" to 3/8" in height.

3.17 FLOOR AND CEILING PLATES

- A. All exposed pipes passing through floors, ceiling, or walls shall be provided with approved nickel or chromium plated cast brass ceiling plates securely attached with set screws.

3.18 DEMOLITION

- A. Each contractor shall remove those items shown on the plans to be removed for each respective trade.
- B. All items to be removed or discarded are property of the Owner and shall be stacked as directed by the Architect or Owner unless notified by the Architect to become property of the Contractor in which case all items shall be removed from the site.
- C. Contractor shall take care not to damage more of the existing facilities than is absolutely necessary. All concrete to be removed shall be cored or sawed to widths to allow the installation of pipes or conduits indicated and replaced by Contractor who occasions the work.

3.19 EQUAL MATERIAL CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

3.20 INSTRUCTION MANUALS

- A. Furnish four (4) complete bound copies of Instruction Manuals on all operating equipment to Owner. Manuals: complete with repair instructions, replacement parts list, and complete operating instructions and wiring diagrams.

3.21 TESTS AND ADJUSTMENTS

- A. After completion of the work but before final payment is made, the Contractor shall run test over a sufficient period of time to prove the proper capacity and performance of apparatus, etc., and of system as a whole to the approval of the Architect and Engineer. See Testing section of the Specifications.

3.22 GUARANTEE

- A. This Contractor shall guarantee the workmanship and material against defects for a period of one (1) year from the date of acceptance, unless specified otherwise in other sections of this specification.

END OF SECTION 15010

SECTION 15020 – TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Provide specified testing, as required by the International Energy Conservation Code (IECC) and all governing authorities.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

PART 2 - PRODUCTS

2.1 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit a certificate signed by the job superintendent certifying that all tests have been satisfactorily completed.

PART 3 - EXECUTION

3.1 MECHANICAL SYSTEMS

- A. All testing required under the contract of the plumbing contractor or heating and ventilating and air conditioning contractor shall be approved by the Engineer before acceptance.
- B. The contractor shall perform the various tests as specified and as required by State and Local Authorities. The Contractor shall furnish all fuel and materials necessary for making tests.
- C. Any leaks or defective material found shall be repaired and replaced, and tests shall be repeated until no further leaks or defects are indicated.
- D. Drainage System: The entire drainage and venting system shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the highest vent stack without showing a drop of greater than four inches (4"). Where a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system, except that a vertical stack ten feet (10') above the highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure, or a pump may be used to supply the required pressure. The pressure shall be maintained for four (4) hours.
- E. Gas Piping: All gas piping, modified by this project, shall be tested under a pressure of 15" of mercury air pressure for a period of twenty-four (24) hours and be proof tight.
- F. Air Balancing: All supply and return air registers shall be balanced by the Contractor to supply CFM shown, and results of all tests, together with type of equipment used, shall be submitted to the Architect's office at completion of the job, and if the Architect deems it necessary, this Contractor shall perform such tests as may

be necessary to illustrate to the satisfaction of the Architect that equipment installed performs properly. Damper operators shall be accessible for adjustment.

END OF SECTION 15020

SECTION 15060 - PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This contract shall include the furnishing and installation of all labor and material necessary to complete all plumbing and gas fitting as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 PIPING GENERALLY

- A. Type of piping for the various systems shall be as specified under specific headings.
- B. Pipe ends shall be square cut. Ends of pipes shall be reamed and shall be wiped clean to remove cuttings. Before installation, pipe shall be stood on end and rapped sharply to remove cuttings and other foreign material from interior. Pipe shall be thoroughly cleaned inside and outside.
- C. Screwed joints shall be made with best linseed oil and graphite or "Jointite" used on male threads only. Omit compound on two (2) end starting threads.
- D. Pipe shall be accurately cut to fit. Bending or springing of pipe will not be permitted.
- E. The various service pipes, valves, fittings, etc., running parallel with each other and near together shall be in line with each other and shall be kept a sufficient distance from each other and other work, to permit not less than 1/2" between finished coverings on the different services.
- F. No unions are to be placed in any pipe in a location which will be inaccessible after completion of the building unless so shown on drawings or specified. Unions must be installed on each side of all special valves, regulators, etc., and one (1) side of all check valves, thermostatic traps, and at all pieces of equipment such as pumps, condensers, tanks, etc., so that such equipment may be readily disconnected.
- G. Each Contractor shall furnish all foundations, structural or pipe supports indicated or called for specifically, or that may be required to support his particular equipment and material, unless hangers are definitely indicated as being furnished by others. All horizontal runs of piping shall be securely supported by pipe hangers spaced not more than 10' apart, and closer when necessary to prevent sagging. Soil pipe shall be supported every 5'.
- H. Perforated strap hangers will not be allowed for any part of hangers.
- I. Swing joints, offsets, and anchors shall be provided in piping where required to provide for and control

expansion or contraction of pipe.

- J. All piping, shall be installed above finished first floor slab, unless otherwise noted on the Drawings.

2.2 EQUAL MATERIALS CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

2.3 MATERIALS

- A. Locations for various kinds of pipe materials shall be in accordance with the schedule following:
1. Standard weight black steel pipe, Schedule 40, with screwed malleable fittings:
 - a. Aboveground gas piping within building to 3'-0" outside the building line.
 2. Schedule 40 PVC pipe and fittings:
 - a. Condensate drain lines.
 - b. traps discharging into drain pans on roof.
 3. Plastic DWV pipe and fittings:
 - a. Underground sanitary drainage piping within the building line and exterior of the building line.
 - b. Aboveground vent and drainage piping.
 4. Type L hard drawn copper with brass solder fittings:
 - a. Aboveground domestic water piping within the building 4" and smaller in size.
 - b. Drainage pipe where shown on the drawings.
 5. Type K hard drawn copper with brass solder fittings:
 - a. Domestic water supply piping underground, inside masonry walls, and under concrete slabs within the building line and elsewhere as noted. .
 6. AWWA C-900 PVC Class 200-DR14 water piping 4" and larger.
 - a. Fire protection lines to 3' from building line.

PART 3 - EXECUTION

3.1 COPPER WATER PIPING:

- A. Pipe and tubing shall be cut accurately to measurements established at the building by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping aboveground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branches from service lines may be taken off top of main, bottom of main, or side of main, using such crossover fittings as may be required by structural or installation conditions. Service pipes, valves, and fittings shall be kept a sufficient distance from other work and not less than 1/2" between finished covering on the different services. No water piping shall be buried in floors unless specifically indicated on the drawings or approved. Changes in sizes shall be made with reducing fittings. The use of long screws and bushing will not be permitted. Where contractor connects copper to galvanized steel piping or hot water heaters, furnish and install insulating couplings.
- B. Drains indicated on the drawings in connection with the water distribution system shall be 1/2" brass plugs. Additional drains shall be installed at low points on the hot-water and cold-water piping, and all piping shall grade down to the drains.
- C. Allowance shall be made throughout for expansion and contraction of tubing. Horizontal runs of tubing over 50' in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided, toward the ends.
- D. Air chambers shall be provided on both hot and cold supplies near each faucet or control valve, as applicable, and where not definitely shown on the drawings shall consist of a 12" length of tubing of the same diameter as

the branch supply, fitted with a cap. Air chambers shall be securely fastened to the building structure.

- E. Tubing shall be cut square, and burrs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and tubing when making connections. All joints shall be made with fittings. Joints for aboveground soldered fittings shall be made with a non-corrosive paste flux and solid string silver solder, and all underground joints shall be made with silfos only. Cored solder will not be permitted. Threaded swing joints shall be provided on all branch connections to mains and risers to provide for expansion and contraction of tubing. 95-5 solder shall be used to make joints extending to fixture only.
- F. Underground piping shall be a minimum of 24" below finish and/or natural grades.

3.2 DOMESTIC HOT AND COLD WATER VALVES AND FITTINGS

- A. Valves and fittings for all domestic cold water and hot water services shall be as follows:
 1. Valves shall be ball valves.
 2. Swing check valves 3" and smaller shall be Crane No. 137. Swing checks larger than 3" shall be Crane No. 14493.
 3. Lift check valves 3" and smaller shall be crane No. 366E.

3.3 GAS PIPING:

- A. Gas piping shall be installed parallel with the building and water piping. In finished rooms, piping shall be run concealed in a vented space. Gas piping shall not be run under floor slabs, unless specifically noted, and then shall be in Orangeburg or PVC airtight vented sleeves with metal fitting in an approved manner.
- B. Joints for steel pipe shall be made with graphite and oil or an approved graphite compound applied to the male thread only. After cutting and before threading, all pipe shall be reamed and shall have burrs removed. Threads shall be full cut, and not more than three (3) threads on the pipe shall remain exposed. Caulking of threaded joints to stop or prevent leaks will not be permitted. Joints for polyethylene pipe shall be made with heat fusion couplings as recommended by the manufacturer.
- C. Underground piping shall be a minimum of 30" below finish and/or natural grade. A 16 ga. copper tracer wire shall be buried with all nonmetallic piping and stubbed out at each end.
- D. Make final connection to all items of equipment, as shown and required, using unions and shut-off valves in each location. Provide a flexible line of minimal length at each piece of equipment.

3.2 PIPE HANGERS AND FIXTURE SUPPORTS

- A. Pipe hangers and fixture supports shall be furnished and set, and the Contractor shall be responsible for their proper and permanent locations.
- B. Horizontal runs of copper tubing shall be supported by approved steel plastic coated hangers spaced not more than 8' o.c. Horizontal runs of drainage and vent pipes shall be supported by adjustable expansion pipe hangers having bolted hinged loops and turnbuckles, or an approved equal. Hangers on drainage and vent pipe shall be spaced not more than 10' o.c. Hanger and collars shall be of size proportionate to the weight of the pipe supported.
- C. Fixtures and equipment shall be supported and fastened in a satisfactory manner. Where secured to concrete or brickwork walls, they shall be fastened with brass expansion bolts. Expansion bolts shall be 1/4" brass bolts with 20 threads to the inch and of sufficient length to extend at least 3" into solid concrete or brickwork, fitted with loose tubing or sleeves of proper length to bring expansion sleeves in the solid concrete or brick

wall. Where secured to tile walls or partitions, they shall be fastened with 1/4" brass toggle or through bolts. Where through bolts are used, they shall be provided with plates or washers at back, set so that heads, nuts, and washers will be concealed by plaster. Bolts and nuts shall be hexagon, and exposed bolts, nuts, and screw heads shall be provided with chromium plated brass washers.

- D. Copper pipe hangers shall be similar to Grinnell No. 260 with plastic coating for non-insulated water piping and Grinnell No. 300 for insulated water piping. Drainage and vent pipe hangers shall be similar to Grinnell No. 590.

END OF SECTION 15060

SECTION 15250 - INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This contract includes furnishing and installing all insulation specified herein.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 PIPE AND DUCT INSULATION

- A. All insulation required under the Plumbing contract and Heating and Air Conditioning Contract shall be equal to and as manufactured by Knauf Fiber Glass, or Johns-Manville, and shall be applied in accordance with the manufacturer's directions and recommendations.
- B. Insulation:
 - 1. Water Piping Within Building Lines - Shall be insulated with 1" thick fiber glass pipe insulation with a factory applied all service jacket with self-sealing lap.
 - 2. Pipe Fittings - Insulate pipe fittings with Manville Zestons according to manufacturer's recommendation.
 - 3. Condensate Drain Lines - Shall be insulated with Johns-Manville Aerotube, 1/2" thick, or approved equal. Secure joints with #57 adhesive.
 - 4. PVC, CPVC, or any flammable piping, shall be fully wrapped with foil face fiberglass duct wrap in installations exposed to a return air plenum.
 - 5. Overhead Heating and Air Conditioning Sheet Metal Ducts Above Ceilings - Shall be insulated with 2" fiber glass duct wrap with aluminum foil Kraft vapor barrier, and shall be secured to ductwork with an approved adhesive and be sealed and stapled in place, 3/4 lb. density.
 - 6. Contractor at his option may use interior duct liner in lieu of exterior insulation. Duct liner shall be Certainteed #150 Ultralite Duct Liner, or approved equal, 1-1/2 lb. per cubic ft. density with vinyl spray one side. All transverse joints shall be protected against air erosion by properly sealing all edges and securing with sheet metal clips. Duct liner shall be secured with mastic, 100% coverage and clips 18" on center. All exposed rectangular ducts shall be lined.
- C. Where insulation is indicated to be applied inside of ducts, exterior insulation will not be required.
- D. Where insulation occurs inside of ducts, allowance shall be made in sheet metal ductwork to accommodate the total insulation thickness. Duct dimensions indicated represent net inside clearances.

2.2 EQUAL MATERIALS CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

2.3 SMOKE AND FLAME SPREAD

- A. All duct and pipe insulation shall have a flame spread no greater than 25 and a smoke developed rating no greater than 50.

PART 3 - EXECUTION

3.1 INSULATION

- A. All insulation shall be applied to clean surfaces and in accordance with the manufacturer's recommendations.

END OF SECTION 15250

SECTION 15500 - AUTOMATIC FIRE PROTECTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section covers the materials, design, installation and testing of the automatic fire protection system as specified and shown on the drawings. Contractor shall install a complete system in accordance with NFPA 13 for the type facility involved and ensure 100% coverage for the entire building.
- B. Referenced Standards: The following publications form a part of this specification to the extent indicated by the reference thereto:
1. National Fire Protection Association (NFPA) Standards:
No. 13 - Standard for the Installation of Sprinkler Systems
 2. Underwriters Laboratories, Inc. (UL) Publication:
Fire Protection Equipment List
 3. Factory Mutual System (FM) Publication:
Approved Guide
- C. General Requirements: The sprinkler system shall be installed in strict accordance with all mandatory and recommended provisions of NFPA No. 13 for wet pipe systems.
- D. Design: Hydraulic design shall be based on an occupancy of light hazard.
- E. Authority Having Jurisdiction: For interpretation of the NFPA Standard the "Authority Having Jurisdiction" referred to in the Standard shall be the Fire Marshal. The Contractor agrees to accept such interpretations by the same without additional cost to the Owner.
- F. Qualification of the Contractor: The Fire Protection System shall be installed by an experienced firm regularly engaged in the installation and design of automatic sprinkler systems. The Contractor shall have a "Certificate of Registration" or proof of qualifications as required by the State or the Fire Marshal. The fire protection design and layout shall have the approval of the Engineer and Fire Marshal. The Engineer may reject any proposed installer who cannot show evidence of such qualifications.
- G. Materials and Equipment List and Approval: The Contractor shall submit to the Engineer for approval a complete list of all materials, equipment and accessories proposed for installation, in compliance with the drawings and specifications. This list shall include catalog identification numbers, drawings, catalog cuts, and other descriptive data and material necessary to define completely all components of the work. No consideration will be given to partial list submitted from time to time. Approval of materials and equipment will be based on manufacturer's published data, and will be tentative, subject to submission and approval of complete shop drawings.
- H. Shop Drawings:
1. The contract drawings show the areas which require sprinkler systems. The Contractor shall submit complete working drawings on reproducible mylars and calculations of the sprinkler system and such other descriptive data as the Engineer may require to demonstrate compliance with the contract documents.
 2. Shop drawings will be submitted at one time to demonstrate that pertinent items of equipment have been properly coordinated and will function properly with each other. No installation work will be permitted prior to approval of complete shop drawings.
 3. Submittal drawings shall be accurately drawn on blank mylar or vellum sheets. Drawings shall be identical in size, scales, and orientation as the contract drawings, and conform to the requirements established for working plans by NFPA No. 13.
 4. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons, therefore, shall be

submitted with the shop drawings and hydraulic calculations. Approved departures shall be made at no additional cost to the Owner.

- 5. All calculations shall be submitted for approval showing piping designs, water supplies, available pressures, residual pressures, etc. as required by NFPA for hydraulic designs.

- I. Record Drawings: Upon completion of the work, the Contractor shall revise the original shop drawings to agree with the construction as actually accomplished. These drawings shall be delivered to the Engineer.

1.2 RELATED DOCUMENTS

- A. Applicable requirements of the General Conditions, Supplementary Conditions and General Requirements apply to the work specified in this section.

1.3 EQUAL MATERIAL CONSIDERATION

- A. Approval of equipment other than that specified does not relieve the Contractor from the responsibility of modifying the equipment if necessary to meet Structural, Architectural, Electrical, or Mechanical conditions as detailed and specified on the drawings.

PART 2 PRODUCTS

2.1 GENERAL

- A. All material and equipment shall be new and the current standard products of the manufacturer. Where two or more items of equipment performing the same function are required, they shall be exact duplicates, produced by one manufacturer. However, component parts need not be products of the same manufacturer.
- B. All materials and equipment shall be UL listed and/or FM approved for systems of the type indicated on the drawings, and conform to the requirements of NFPA No. 13.

2.2 MATERIALS AND EQUIPMENT

- A. The following is a listing of materials and equipment requirements. It is not intended that all items will necessarily be required, but that those required for the work conform to this listing.

- 1. Pipe and Fittings: All pipe and fittings shall be non-galvanized except where galvanized is required by NFPA No. 13.

<u>ITEM</u>	<u>SIZE (INCHES)</u>	<u>SPECIFICATION</u>
Pipe	All Above ground	Schedule 40 or Schedule 10 Steel, ASTM A120-83 or A53
Fittings screwed	All	Cast iron 125 lb. on Sprinkler System
Fittings flanged	All	Cast iron 125 lb. on Sprinkler System
Fittings welding	All	Steel, Sch. 40, ANSI B16.2
Grooved Fittings	All	Malleable iron ASTM A47-77 or Ductile iron ASTM 536 500 lb.
Flanges	All	Cast iron 125 lb. on Sprinkler System

Threadolet sockolets	Through 2"	Steel, ANSI B16.11, ASTM A105
Weldolets	2" & larger	Steel, 90 deg. STD only, ANSI B16.9, ASTM A105
Unions	Through 2"	Malleable iron, 300 lb. bronze to iron ground joint
Pipe	All Below Ground	Class 150 Ductile Iron or PVC Clowe
Fittings	Below Ground	Class 150 Mechanical Joint, Trinity Valley
Sprinkler Head Type		Semi-Recessed
Vertical supports, all hangers and connections (non- seismic bracing)	All	Approved type, in accordance with NFPA No. 13 requirements
Sprinkler escutcheons		One or two-piece chrome depth as required to provide clearance in accordance with NFPA No. 13 except where otherwise specified on drawings
Sprinkler Guard		Approved guard, standard baked enamel finish

PART 3 EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

- A. Piping material, including valves and fittings shall be delivered to the site in a clean condition and protected against entry of foreign material.

3.2 CLEANING

- A. Prior to erection the interior or all piping shall be cleaned of all metal cuttings, loose scale, or other foreign materials. At the discretion of the Engineer, non-welded piping and welded piping with backing rings may require brush cleaning as above. After erection and prior to testing, all valves, caps, and plugs at all low points in the system shall be opened and the system thoroughly flushed with water.

3.3 JOINTS

- A. Joints shall be the threaded, flanged, welded, or grooved. Shop welded joints in accordance with NFPA No. 13 will be permitted. Flanged connections shall be provided where indicated on the drawings or required by NFPA No. 13.
1. Threaded Joints: Threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1. Threaded joints shall be made tight with an approved thread joint compound or tape. Joint compound shall be applied lightly but sufficiently to cover male threads only. Leaking joints shall not be repaired by peaning or packing.
 2. Flanged Joints: Flanged joints shall be faced-true, provided with non-metallic full face gaskets and made square and tight. When made up, flange bolts shall extend through nuts by at least one full thread. No flanges shall be placed in locations which will be inaccessible after erection.
 3. Welded Joints: All welding, including methods and qualifications of welders, shall be in strict accordance with the standards and requirements specified in NFPA No. 13. Welded branch connections to headers shall be made by the use of threadolet, sockolet, and weldolet.
 4. Groove Joints: All grooving shall be in accordance with NFPA No. 13.

5. Cutting: Pipe shall be cut accurately to measurements shown on the drawings and to suit field conditions, and shall be carefully worked into place without forcing or springing. All cuts shall be reamed to remove fins and burrs.

3.4 PIPE SUPPORTS AND HANGERS

- A. Special supports and hangers shall be as detailed and located on drawings. Supports and hangers not detailed on drawings shall be an approved type, installed in accordance with NFPA No. 13. Ring hangers shall be of the adjustable type. Offsets in hanger rods will not be acceptable.

3.5 PIPE SLEEVES

- A. Pipes passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves. Each sleeve shall extend through its respective wall or floor, and be of sufficient size as to provide a minimum of 1/2" all-round clearance between pipe and sleeve. Sleeves in walls shall be cut flush with the surface and sleeves in floors shall extend two inches above floor surfaces, unless otherwise shown on drawings. Sleeves in non-bearing walls, floors, or ceilings may be steel pipe, cast iron pipe, or galvanized sheet metal with lock-type longitudinal seam.
- B. Where pipes pass through fire walls, fire partitions, or floor/ceiling assemblies, the Contractor shall furnish and install fire seals, U.L. listed, type LS, link seal, as manufactured by Thunderline Corp. Fire and smoke seals shall be installed in steel pipe sleeve of correct size for pipe and insulation.

3.6 ESCUTCHEONS

- A. Pipe escutcheons shall be provided at all finished surfaces where exposed piping passes through floors, walls or ceilings. Sprinkler escutcheons shall be provided for all pendent heads through ceilings. Escutcheons shall be fastened securely to the pipe.

3.7 SIGNS

- A. All control, drain and inspector's test valves shall be provided with identification signs.

3.8 SPARE SPRINKLERS

- A. Spare automatic sprinklers with cabinets and one sprinkler wrench for each cabinet shall be furnished. The number and types of sprinklers shall be in accordance with NFPA No. 13 requirements for stock of spare sprinklers. The cabinets shall be mounted where indicated on drawings or directed by Engineer.

3.9 ELECTRICAL

- A. All electrical work in connection with the installation of the fire protection system shall be performed in accordance with Section 16010 - General Electrical Provisions, and Section 16721 - Fire Alarm and Detection System.

3.10 TESTS

- A. Upon completion and prior to acceptance of the installation, the Contractor shall subject the system to the tests required by NFPA No. 13 and furnish the Engineer with a test certificate signed by official of local fire department.

3.11 WARRANTY AND GUARANTEES

- A. All materials and workmanship shall be guaranteed for one (1) year from date of completion to be free of defects.

END OF SECTION 15500

SECTION 15650 - AIR CONDITIONING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Contractor shall furnish and install where shown on the drawings, complete Summer-Winter, indoor and outdoor mounted air conditioning systems as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.
- C. For packaged rooftop heating and air conditioning units, the submittal data must include the actual fan motor HP and fan performance tables that demonstrate that the specified performance can be obtained at a fan drive setting (or motor speed) at less than maximum.

1.4 REBATES AND INCENTIVES

- A. Any and all rebates or incentives offered by utility companies or equipment manufacturers shall go directly to the Owner.

PART 2 - PRODUCTS

2.1 AIR CONDITIONING UNITS

- A. All units shall be of the same manufacturer and shall have capacities and efficiency ratings as scheduled. Any deviations to the specified parameters shall be indicated on this Contractor's proposal when presented to the construction manager.
- B. Units shall be manufactured by Carrier, as scheduled on the drawings. Units other than those scheduled on the drawings may be considered, but must meet or exceed the performance and construction of the specified system. Acceptable manufacturers for consideration as a substitution are Trane, Lennox, Rheem, JCI/York, or American Standard.

2.2 FURNACE COIL & CONDENSING UNIT:

- A. This Contractor shall furnish and install summer and winter heating, air conditioning and ventilation unit complete with indoor furnace, evaporator, filters, and outdoor condensing unit. The system shall be as manufactured by Trane Co., Lennox Industries, Carrier Corporation, or approved equal. All equipment shall be by the same manufacturer. The unit shall be complete with all controls, filters and adapters to make a complete operable system.
- B. The furnace shall be gas fired and the high efficiency type (minimum 90%) with capacities as listed on the drawings. The entire furnace assembly shall be A.G.A. certified. The heat exchanger assembly shall consist of primary and secondary units for high efficiency operation. The heating section shall have a spark igniter, flame sensor, and combustion air and gas intake manifolds. The primary heat exchanger shall be constructed of aluminized steel with the secondary heat exchanger constructed of stainless steel. The cabinet

shall be constructed of heavy gauge cold rolled steel with a baked-on enamel finish. The heat exchanger section shall be lined with 1-1/2 lb. density foil-faced fiberglass insulation. Furnaces shall be complete with multiple speed direct drive blowers statically and dynamically balanced. The blower assembly shall slide out for easy servicing. The filter section shall consist of polyurethane media and shall be cleaned by washing or vacuuming.

- C. The evaporator coil shall be for vertical installations and mounted in a cabinet of galvanized steel with baked enamel finish completely lined with fiberglass insulation. The cabinet shall have a deep corrosion resistant drain pan with dual drain connections. The coil shall be constructed of ripple-edge aluminum fins mechanically bonded to copper tubes. The metering device shall be a thermostatic expansion valve and shall be rated in accordance with ARI Standard 210.
- D. The air-cooled condensing unit shall be for outdoor installations and shall be complete with all controls and wiring. The cabinet shall be constructed of galvanized steel with a baked enamel finish. The compressor and control box shall be located in a separate compartment lined with fiberglass insulation and have a removable panel for service access. The condensing unit shall be designed for vertical air discharge and shall have non-corrosive PVC coated steel condenser fan guard and condenser coil hail guards. The compressor shall be hermetically sealed with built-in protection devices for protection from excessive current and temperatures. The compressor shall be suction cooled, overload protected and equipped with a crankcase heater and the entire running gear shall be spring mounted. The coil section shall be constructed of rippled-edged aluminum fins mechanically bonded to copper tubes. The condenser fans shall have a direct drive motor inherently protected and totally enclosed. Other accessories for the condensing unit shall include refrigerant dryers, high pressure switch, start controls, expansion valve kit, timed-off controls and low ambient controls. The entire unit shall be rated in accordance with ARI Standard 210-81 and shall be U.L. listed.
- M. Basic Unit Control System:
 1. Thermostats shall be equal to a Honeywell TH8320R1003. Where indicated on the drawings, provide and install remote temperature sensors. Sensor model numbers and wiring shall be as indicated on the wiring diagrams, included on the drawings.
 2. Each unit shall be equipped with a positive fan start device on a call for heat.
 3. The condensing units shall be furnished with time off cycle devices to prevent short cycling of the compressors. They shall also have high- low pressure cutouts, 3 leg overload protection and internal thermostats in the compressor to limit winding and discharge temperature to safe limits. Units shall have low-ambient controls.
 4. Refrigerant control shall be by thermostatic expansion valves.
 5. In addition to the above, contactors, relays and safety devices necessary for a complete operational system shall be furnished.

2.3 WARRANTIES

- A. All heating and air conditioning equipment shall have a five year warranty on compressors, 10 years on heat exchangers and 1 year on all other parts.

PART 3 - EXECUTION

3.1 ADJUSTMENT

- A. Upon completion of work the Contractor shall balance the system so that the quantity and proper velocity of air is delivered at each outlet uniformly as indicated on the drawings to within ten percent (10%). Necessary adjustment shall be made to the system and fan speeds to produce these quantities of air, and to eliminate any objectionable drafts or noise which might exist. Balance adjustments shall be made upstream of the registers and diffusers, leaving the O.B.D. in each grille neck fully open.

- B. When balancing has been completed, the Contractor shall provide the Architect with all necessary data, readings, and velocities at each outlet to substantiate that the systems are balanced and providing the necessary quantities of air as shown on the drawings.

END OF SECTION

SECTION 15804 - VENTILATING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specifications shall include the furnishing of all labor and materials as required for the installation of a complete ventilating system and its related work.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 EXHAUST & SUPPLY FAN SYSTEMS

- A. Furnish and install systems all as shown on the drawings.
- B. Provide ducts, properly flashed and waterproofed as shown.
- C. All fans shall be as manufactured by Greenheck, Cook, Penn-Barry, Twin Cities, or approved equal. Units shall be complete with bird screens, disconnect switches, wall mounting frames, and backdraft dampers.
- C. Direct drive fans shall be provided with fan speed controllers, for use in balancing systems.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The systems shall be installed complete with all ductwork, fans and controls as shown on the drawings.
- B. All roof mounted units shall be mounted on roof curbs and secured by sheet metal screws.
- C. Fans shall be controlled by wall mounted switches, interlocked with light switches, controlled by temperature sensing devices, or controlled by the building automation systems, all as scheduled on the drawings.

END OF SECTION 15804

SECTION 15840 - DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specifications includes the furnishings of all material and labor as required for the installation of a complete duct system, as shown on the drawings and as herein specified.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 LOW VELOCITY - LOW PRESSURE DUCTWORK

- A. All ductwork shall be of the sizes indicated on the drawings, shall be straight and smooth on the inside with neatly finished airtight joints. The ducts shall be installed as to be completely free of vibration. Metal duct slip joints shall be made with an inside radius of not less than the width of the duct, except that Factory Fabricated Air Turns shall be used where a sharper turn must be made or where otherwise indicated on the drawings. All takeoffs to registers shall be made with Factory Fabricated Deflectrols, or approved equal, and all major branches where noted on the plans shall have splitters with an accessible operating handle and locking device, Young Model No. 917 right angle gear and No. 1 ceiling regulator, or approved equal.
- B. All ductwork shall be constructed of galvanized iron sheets fabricated and installed in accordance with SMACNA HVAC Duct Construction Standards for Low Velocity Systems.
- C. Air turns shall be as manufactured by Barber-Colman, or approved equal. No job-built turning vanes will be used on this job. Where insulation is applied inside of ducts, turning vanes shall be installed inside of insulation.
- D. After all ducts are installed, all dirt and debris shall be removed from inside of ducts.
- E. Ductwork for round ducts shall conform to the latest edition ASHRAE guide.
- F. All duct construction seam corners and connections shall be sealed with white "Permagum Slugs" as manufactured by Virginia Chemicals, Inc.
- G. All ductwork shall be made airtight and reinforced as required for pressures as shown on the drawings.
- H. All dimensions indicated shall be sheet metal dimensions. Allowance shall be made for internal insulation as it occurs, unless otherwise noted on the drawings.

2.2 ACCESS DOORS

- A. Access doors in ductwork shall be 2" smaller in height than duct dimensions and 12" wide and located in accessible locations on both sides of all fire and smoke dampers. Doors in vertical position shall be equal to Ventlok insulated type, complete with all hinges, hardware and air seal. Doors in horizontal position shall be job built complete with sash lock, two (2) per side, and rubber air seal, all as manufactured by Ventlok, or approved equal.

2.3 ZONE VOLUME CONTROL DAMPERS

- A. Volume control dampers shall be furnished and installed where shown on the drawings for all air unit zone ducts with locking operator installed on bottom side of ducts.
- B. Dampers shall be the opposed blade type with corner bracing for stiffening as manufactured by Young Regulator Co., Model No. 817, or approved equal, of size shown on the drawings.
- C. Spin-In taps shall be equal to Dace #MSD-CO5. With ROSSI seven position manual volume control.

2.4 FIBER DUCTWORK

- A. Fiber ductwork will not be used on this job anywhere.

2.5 LOW PRESSURE FLEXIBLE CONNECTIONS

- A. Furnish and install flexible connections of 30 ounce woven glass fabric from discharge and return openings of equipment to ductwork. The flexible connections shall be of a type that is airtight, equal to Ventfabrics "Ventglas", and shall be installed in such a manner that the air flow is not restricted nor the connection leaks air. At least 1" slack shall be allowed in connection to insure that no vibration is transmitted from fans to ductwork.
- B. Fabric connections shall be UL approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All duct systems shall be installed in a workmanlike manner and shall provide a complete and working system.
- B. Hangers for ductwork shall be galvanized steel straps and/or electro-plated zinc or hot-dipped galvanized after threading, threaded rods, minimum of 3/8" diameter.
- C. Hangers shall be spaced a maximum of 8'-0" on center.
- D. When threaded hanger rods are used, bearing plate shall be on channel and/or angle, hot-dipped galvanized after cutting, and drilling of hanger rod holes.
- E. Hanger rods shall be secured to channels and/or angle by galvanized washer, nut, and locknut. Hanger rods shall be suspended from super-structure.

3.2 CLEANING

- A. After installation is complete, all equipment shall be thoroughly cleaned. Filters shall be cleaned and/or replaced with new. Damaged paint shall be sanded and touched-up. All damaged insulation shall be replaced.

END OF SECTION 15840

SECTION 15870 - GRILLES, REGISTERS AND CEILING DIFFUSERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section of the specification includes the furnishing of all labor and materials as required for the installation of a complete air diffusing system as shown on the drawings, and as hereinafter specified. All side wall grilles, supply and returns, shall comply with NFPA Standard No. 90A.

1.2 RELATED DOCUMENTS

- A. Refer to other applicable clauses and regulations for other requirements.

1.3 SUBMITTAL

- A. All submittal required by this section shall be submitted in accordance with Section 01300.
- B. Submit manufacturer's data for approval on all materials to be furnished as part of this project.

PART 2 - PRODUCTS

2.1 SIDE WALL REGISTERS

- A. All side wall registers shall be extruded aluminum with removable cores.

2.2 CEILING SUPPLY DIFFUSERS

- A. Ceiling supply diffusers, except where shown on the drawings and/or specified, shall be as shown on the drawings. All diffusers shall be equipped with deflectrols and opposed blade volume controls operated from the face of the diffusers.
- B. Ceiling diffusers shall be of the removable core type for 1, 2, 3 or 4-way deflection as shown on the drawings.

2.3 CEILING RETURN AIR GRILLES

- A. Ceiling return air grilles shall be all as shown on the drawings.

PART 3 - EXECUTION

3.1 GUARANTEE

- A. This Contractor shall ensure that the grilles, registers and diffusers are recommended by the manufacturer for the installation in the surfaces as shown and the application shown.

END OF SECTION 15870

CONSULTANTS' PROFESSIONAL RESPONSIBILITY

The specifications sections to be authenticated by my seal and signature are limited to the following:

Division	Section Title	Pages
DIVISION 26 - ELECTRICAL		
260110.....	GENERAL PROVISIONS FOR ELECTRICAL	6
260120.....	MINOR ELECTRICAL DEMOLITION	2
260519.....	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES	4
260526.....	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.....	7
260529.....	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.....	6
260533.....	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.....	12
260544.....	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING ..	4
260553.....	IDENTIFICATION FOR ELECTRICAL SYSTEMS.....	9
260923.....	LIGHTING CONTROL DEVICES.....	6
262416.....	PANELBOARDS	9
262726.....	WIRING DEVICES.....	8
262816.....	ENCLOSED SWITCHES AND CIRCUIT BREAKERS.....	7
265119.....	LED INTERIOR LIGHTING	7
DIVISION 28 - ELECTRONIC SAFETY AND SECURITY		
280513.....	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY	5
283111.....	DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM.....	15

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SECTION 260110 - GENERAL PROVISIONS FOR ELECTRICAL

I. GENERAL

A. RELATED DOCUMENTS:

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

B. ELECTRICAL LINES:

1. General: In general, the electrical lines to be installed under these Specifications shall be run as indicated, as specified herein, as required by particular conditions at the site, and as required to conform to the generally accepted standards as to complete the work in a neat and satisfactorily workable manner. The following is a general outline concerning the running of electrical lines and is to be excepted where the drawings or conditions at the building necessitate deviating from these standards.
2. General Construction: The Contractor shall thoroughly acquaint himself with the details of the construction and finishes before submitting his bid as no allowances will be made because of the Contractor's unfamiliarity with these details. Place all inserts in masonry walls while they are under construction. All concealed lines shall be installed as required by the pace of the general construction to precede that general construction.
3. Field Conditions: The electrical Drawings do not give exact details as to elevations of electrical lines, exact locations, etc., and do not show all the offsets, and other installation details. The Contractor shall carefully lay out his work at the site to conform to the architectural and structural conditions, to avoid all obstruction, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactorily operating installation.
4. Locations of Electrical Devices: The electrical Drawings show diagrammatically the locations of the various electrical outlets and apparatus and the method of circuiting and controlling them. Exact locations of these outlets and apparatus shall be determined by reference to the general Drawings and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with other sections, and in all cases shall be subject to the approval of the Architect. It is assumed the Architect/Owner reserves the right to make any reasonable change in location of any outlet, switch, receptacle, fixture or panelboard or apparatus before installation (within a 10 feet radius of location shown on drawings) or after installation if an obvious conflict exists, without additional cost to the Owner.
5. Space Requirements: The Contractor shall be responsible for the proper fitting of his material and apparatus into the space. Should the particular equipment that any bidder proposes to install require other space conditions than those indicated on the drawings, he shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with this clause, the Contractor shall make such necessary changes at his (the Contractor's) own expense.
6. Working Drawings: The Contractor shall submit scale working drawings of all his apparatus and equipment which in any way varies from these Specifications and Drawings. The Architect shall check these variations from the Specifications and Drawings before the work is started. Before the work proceeds, the contractor shall correct any interference with the structural conditions.
7. Order of Precedence: Order of precedence shall be observed in laying-out the conduit in order to fit the material into the space above the ceiling and in the chases and walls. The installation shall be coordinated with the work of all other trades. The following order shall govern:
 - a) Items affecting the visual appearance of the inside of the building such as lighting fixtures, outlets, panelboards, etc. Coordinate all items to avoid conflicts at the site.
 - b) Lines requiring grade to function such as sewers.
 - c) Large ducts and pipes with critical clearances.

- d) Conduit, water lines, and other lines whose routing is not critical and whose function bends and offsets would not impair.
- 8. Equipment Connections: Conduits serving outlets on items of equipment shall be run in the most appropriate manner. Where the equipment has built-in chases, the lines shall be contained therein. Where the equipment is of the open type, the lines shall be run as close as possible to the underside of the top and in a neat and inconspicuous manner.
- 9. Exceptions and Inconsistencies: Exceptions and inconsistencies in Drawings and Specifications shall be brought to the Architect's attention before the contract is signed. Otherwise, the Contractor shall be responsible for any and all changes and additions that may be necessary to accommodate his particular apparatus, material, or equipment.
- 10. Intent of Drawings and Specifications: The Contractor shall distinctly understand that the work described herein and shown on the accompanying drawings shall result in a finished and working job, and any item required to accomplish this intent shall be included whether specifically mentioned or not.
- 11. Examination of Drawings and Specifications: Each bidder shall examine the Drawings and Specifications for the General Construction. If these documents show any item requiring work under Division 16 and that work is not indicated on the respective Electrical drawings, he shall notify the Architect in sufficient time to clarify before bidding. If no notification is received, the Contractor is assumed to require no clarification, and shall install the work as indicated on the General Drawings in accordance with the Specifications.

C. DIMENSIONS:

- 1. General: Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings. Any difference that may be found shall be submitted to the Architect for consideration before proceeding with the work.

D. INSPECTION OF SITE:

- 1. General: The accompanying Drawings do not indicate completely the existing electrical installations. The bidders for the work under these sections of the Specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.
- 2. Utilities: Any overhead, underground or other type mechanical, electrical communication service of any nature damaged by the construction shall be restored to working condition during and after construction to the satisfaction of the Owner. The Owner will make every effort to assist the Contractor, but the location of services shall be the responsibility of the General Contractor and Electrical Contractor.

E. ELECTRICAL WIRING:

- 1. Description: All electric wiring of every character, both for power supply, for pilot and control, for temperature control, etc. will be done under Division 26 of these Specifications. Every electrical current consuming device furnished as a part of this project, or furnished by the Owner and installed in this project, shall be completely wired up under Division 26. Verification of exact location, method of connection, number and size of wires required, voltage requirements, and phase requirements is the responsibility of the Contractor under Division 26. If conflicts occur between the drawings and the actual requirements, actual requirements shall govern.

F. PROGRESS OF WORK:

- 1. General: The Contractor shall keep himself fully informed as to the progress of the work and do his work at the proper time without waiting for notification from the Architect or Owner.

G. MANUFACTURER'S DIRECTIONS:

1. General: All manufactured articles shall be applied, installed and handled as recommended by the manufacturer.

H. MATERIALS AND WORKMANSHIP:

1. Materials: All materials shall be new unless otherwise specified and of the quality specified. Materials shall be free from defects and undamaged. All materials of a type for which the Underwriters Laboratories, Inc. have established a standard shall be listed by the Underwriters Laboratories, Inc. and shall bear their label.
2. Samples: The Architect reserves the right to call for samples of any item of material offered in substitution, together with a sample of the specified material, when, in the Architect's opinion, the quality of the material and/or the appearance is involved and it is deemed that an evaluation of the two materials may be better made by visual inspection. This shall be limited to lighting fixtures, wiring devices, and similar items and shall not be applicable to major manufacturers' items of equipment.
3. Transportation: The Contractor shall be responsible for transportation of his materials to and on the job, and shall be responsible for the storage and protection of these materials and work until the final acceptance of the job.
4. Appurtenances: The Contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.
5. Workmanship: The workmanship shall in all respects be of the highest grade and all construction shall be done according to the best practice of the trade.

I. SUBSTITUTION OF MATERIAL:

1. Where a definite material or only one manufacturer's name is mentioned in these specifications, it has been done in order to establish a standard. The product of the particular manufacturer mentioned is of satisfactory construction and any substitution must be of quality as good as or better than the named article. No substitution shall be made without review by the Architect/Engineer, who will be the sole judge of equality.
2. The Contractor shall submit for approval a complete list of the materials he proposes to use. This list shall give manufacturers' names and designations corresponding to each and every item and the submission shall be accompanied by complete descriptive literature and/or any supplementary data, drawings, etc., necessary to give full and complete details.
3. Should a substitution be accepted under the provisions of the conditions of these specifications, and should this substitute prove to be defective or otherwise unsatisfactory for the service for which it is intended within the guarantee period, the Contractor who originally requested the substitution shall replace the substitute material with the specified material.

J. PROTECTION OF APPARATUS:

1. General: The Contractor shall at all times take such precautions as may be necessary to properly protect his new apparatus from damage. This shall include the erection of all required temporary shelters to adequately protect any apparatus stored in the open on the site, the cribbing of any apparatus above the floor of the construction, and the covering of apparatus in the uncompleted building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above to the entire satisfaction of the Architect will be sufficient cause for the rejection of the pieces of apparatus in question.

K. PERMITS, FEE, ETC.:

1. General: The Contractor under each section of these Specifications shall arrange for a permit from the local authority. The Contractor shall arrange for all utility services, including electric services. If any charges are made by any of the utility companies due to the work on this project, the Contractor shall pay these charges, including charges for metering, connection, street cutting, etc. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these Specifications.

L. TESTING:

1. General: The Contractor under each division shall at his own expense perform the various tests as specified and required by the Architect and as required by the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

M. LAWS, CODES AND ORDINANCES:

1. General: All work shall be executed in strict accordance with all local, state and national codes, ordinances and regulations governing the particular class of work involved, as interpreted by the inspecting authority. The Contractor shall be responsible for the final execution of the work under this heading to suit those requirements. Where these Specifications and the accompanying drawings conflict with these requirements, the Contractor shall report the matter to the Architect, shall prepare any supplemental drawings required illustrating how the work may be installed so as to comply and, on approval, make the changes at no cost to the Owner. On completion of the various portions of the work the installation shall be tested by the constituted authorities, approved and, on completion of the work, the Contractor shall obtain and deliver to the Owner a final certificate of acceptance. The Contractor shall be responsible for providing all labor and materials as required to ensure project is in compliance with all local, state and national codes, ordinances and regulations governing the particular class of work involved.

N. TERMINOLOGY:

1. "Furnish, Provide, Install": Whenever the words "furnish", "provide", "furnish and install," "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.
2. Materials: Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.
3. "Shall": The use of the word "shall" conveys a mandatory condition to the contract.
4. "Section": "This section" always refers to the section in which the statement occurs.
5. "Project": "The project" includes all work in progress during the construction period.
6. Multiple Items: In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

O. COOPERATION:

1. General: The contractor for the work under each section of these Specifications shall coordinate his work with the work described in all other sections of the Specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these Specifications shall be handicapped, hindered or delayed at any time.

P. COORDINATION OF TRADES:

1. General: The Contractor shall be responsible for resolving all coordination required between trades. For example, items furnished under Division 23 which require electrical connections shall be coordinated with Division 26 for:
 - a) Voltage
 - b) Phase
 - c) Ampacity
 - d) No. and size of wires
 - e) Wiring diagrams
 - f) Starter size, details and location
 - g) Control devices and details
2. Ceiling Mounted Items: Items installed in/on finished ceilings shall be coordinated with the ceiling construction. The Contractor under each section shall conform to the reflected ceiling plan and shall secure details and/or samples of the ceiling materials as necessary to insure compatibility. Any device not conforming to this requirement shall be replaced by the Contractor at his expense.
3. Electrical Items: All items specified under Divisions 26 shall be installed tight, plumb, level, square and symmetrically placed in relation to the work of other trades.

Q. CUTTING AND PATCHING:

1. General: The Contractor for work specified under each section shall perform all structural and general construction modifications and cut all openings through either roof, walls, floors or ceilings required to install all work specified under that section or to repair any defects that appear up to the expiration of the guarantee. All of this cutting shall be done under the supervision of the Architect and the Contractor shall exercise due diligence to avoid cutting openings larger than required or in wrong locations.
2. Structural Members: No cutting shall be done to any of the structural members that would tend to lessen their strength, unless specific permission is granted by the Architect to do such cutting.
3. Patching: The Contractor for work under each section shall be responsible for the patching of all openings cut to install the work covered by that section and to repair the damage resulting from the failure of any part of the work installed hereunder.
4. Coordination: Before bidding, the Contractor shall review and coordinate the cutting and patching required with all trades.
5. Existing Surfaces: In all spaces where new work under Division 26 is installed and no other alteration or refinishing work is shown or called for, existing floors, walls and ceilings shall be restored to match existing conditions. Workmen skilled in the affected trade shall do all cutting and patching.
6. Masonry Walls: Where openings are cut through masonry walls, the Contractor under each respective section shall provide and install lintels or other structural supports to protect the remaining masonry and adequate support shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc. shall be of the size, shape, and installed as directed by the Architect.

R. PAINTING:

1. General: Painting for Division 26 shall be as follows:
 - a) If the factory finish on any apparatus or equipment is marred, it shall be touched up and then given one coat of half-flat-half-enamel, followed by a coat of machinery enamel of a color to match the original. Paint factory primed surfaces.
 - b) Paint all exposed conduit, boxes, cabinets, hangers and supports, and miscellaneous metal.
 - c) Generally, painting is required on all surfaces such that no exposed bare metal is visible.

S. LARGE APPARATUS:

1. General: Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through windows, doorways or shafts, shall be brought to the job by the Contractor involved and placed in the space before the enclosing structure is completed.

T. INSTALLATION DRAWINGS:

1. General: It shall be incumbent upon the Contractor to prepare special drawings as called for elsewhere herein or as directed by the Architect to coordinate the work under each section, to illustrate changes in his work, to facilitate its concealment in finished spaces to avoid obstructions or to illustrate the adaptability of any item of equipment which he proposes to use. These drawings shall be used in the field for the actual installation of the work. Unless otherwise directed, they shall not be submitted for approval but three copies shall be provided to the Architect for his information.

U. ROUGH-IN AND MAKE FINAL CONNECTION FOR EQUIPMENT:

1. General: The shop drawings for all equipment are hereby made a part of these Specifications. The Contractor under each section of the Specifications shall rough-in for the exact item to be furnished on the job, whether in another section of the Specifications or by the Owner. The Contractor shall refer to all drawings and other sections of the Specifications for the scope of work involved for the new equipment, and by actual site examination determine the scope of the required equipment connections for the Owner furnished equipment.

2. Discrepancies: Should any of the equipment furnished require connections of a nature different from that shown on the drawings, report the matter to the Architect and finally connect as directed by the Architect. Minor differences in the equipment furnished and that indicated on the drawings will not constitute ground for additional payment to the Contractor.

V. TEMPORARY POWER AND LIGHTING

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
5. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear. All temporary power for construction will be provided by Contractor. Owner will pay bills when submitted for payment.
6. Install electric power service underground, except where overhead service must be used.
7. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, power wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance. All circuits must be ground-fault circuit interrupter protected.
8. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment. Provide four gang outlets, spaced so 100 foot cords can reach any areas. Provide separate 120 VAC, 20 amp GFCI circuit for each four gang outlet.
9. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
10. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching:
 - a) Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
11. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.
12. Provide three 100-W incandescent lamps per 500 sq. ft. (45 sq. m), uniformly distributed, for general lighting, or equivalent illumination. Provide two 100-W incandescent lamps every 50 feet (15 m) in traffic areas.

END OF SECTION 260110

SECTION 260120 - MINOR ELECTRICAL DEMOLITION

I. PART 1 - GENERAL

A. RELATED DOCUMENTS:

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

II. PART 2 - PRODUCTS

A. MATERIALS AND EQUIPMENT:

1. Materials and equipment for patching and extending work: As specified in individual Sections.

III. PART 3 - EXECUTION

A. EXAMINATION:

1. Field Measurements: Verify field measurements and circuiting arrangements are as shown on Drawings.
2. Abandoned Circuits: Verify that abandoned wiring and equipment serve only abandoned facilities.
3. Field Conditions: Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Owner and Architect/Engineer before disturbing existing installation.
4. Existing Conditions: Beginning of demolition means installer accepts existing conditions.

B. PREPARATION:

1. Demolition: Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
2. Utility Coordination: Coordinate utility service outages with Utility Company.
3. Temporary Wiring: Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
4. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
5. Existing Telephone/Data/Computer Network Systems: Maintain existing systems in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and Telephone Utility Company at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
6. Existing Fire Alarm/Nurse Call Systems: Maintain existing systems in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner at least 72 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

C. DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK:

1. General: Demolish and extend existing electrical work under provisions of the Drawings, General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections.
2. New Construction: Remove, relocate, and extend existing installations to accommodate new construction.
3. Abandoned Wiring: Remove abandoned wiring to source of supply.

4. Exposed Conduit: Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
5. Abandoned Devices: Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed.
6. Abandoned Panelboards: Disconnect and remove abandoned panelboards and distribution equipment.
7. Abandoned Equipment: Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
8. Abandoned Lighting Fixtures: Disconnect and remove abandoned lighting fixtures. Remove brackets, stems, hangers, and other accessories.
9. Adjacent Construction: Repair adjacent construction and finishes damaged during demolition and extension work.
10. Existing wiring to remain active: Maintain access to existing electrical installations, which remain active. Modify installation or provide access panel as appropriate.
11. Extension of existing wiring: Extend existing installations using materials and methods compatible with existing electrical installations, as specified.

D. CLEANING AND REPAIR:

1. Existing Materials: Clean and repair existing materials and equipment that remain or are to be reused.
2. Panelboards: Where indicated on the drawings clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
3. Lighting Fixtures: Where indicated on the drawings remove existing lighting fixtures for cleaning. Use mild detergent to clean all exterior and interior surfaces, rinse with clean water and wipe dry. Replace lamps and broken electrical parts.

E. INSTALLATION:

1. Relocated Materials: Install relocated materials and equipment under the provisions of Division 1 of the Specifications.

END OF SECTION 260120

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

- A. VFC: Variable frequency controller.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.

5. General Cable Technologies Corporation.
6. Southwire Incorporated.

- B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.
- D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Gardner Bender.
 3. Hubbell Power Systems, Inc.
 4. Ideal Industries, Inc.
 5. Ilsco; a branch of Bardes Corporation.
 6. NSi Industries LLC.
 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 8. 3M; Electrical Markets Division.
 9. Tyco Electronics.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 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 NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.

- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

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 26 05 33 "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. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."
- G. Complete cable tray systems installation according to Section 26 05 36 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-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 unspliced 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 12 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 26 05 53 "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.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

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 07 84 13 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
 - B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
 - C. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
 - D. Cables will be considered defective if they do not pass tests and inspections.
- END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS.

- 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
- 2) Include recommended testing intervals.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- 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 UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning and Grounding.
 7. ILSCO.
 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.

2.2 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.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.

4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

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. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 1. Bury at least 24 inches below grade.
 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.

2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.5 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.
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- 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.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 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.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.
1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of area or item indicated.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 24 inches from building's foundation.
- J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 feet long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- D. Grounding system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
- G. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.

3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07 72 00 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Atkore International.
 - g. Wesanco, Inc.
 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch-diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. 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) Hilti, Inc.
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.
 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 in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti, Inc.
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. 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.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and 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, IMC, and RMC may be supported by openings through structure members, as permitted in 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.
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 meet seismic-restraint strength and anchorage requirements.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 09 91 23 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.
 - 5. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
 - 2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal 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.
 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Allied Tube & Conduit.
 3. Anamet Electrical, Inc.
 4. Electri-Flex Company.
 5. O-Z/Gedney.
 6. Picoma Industries.
 7. Republic Conduit.
 8. Robroy Industries.
 9. Southwire Company.
 10. Thomas & Betts Corporation.
 11. Western Tube and Conduit Corporation.
 12. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.

- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Anamet Electrical, Inc.
 - 3. Arco Corporation.
 - 4. CANTEX Inc.
 - 5. CertainTeed Corporation.
 - 6. Condux International, Inc.
 - 7. Electri-Flex Company.
 - 8. Kraloy.
 - 9. Lamson & Sessions; Carlon Electrical Products.
 - 10. Niedax-Kleinhuis USA, Inc.
 - 11. RACO; Hubbell.
 - 12. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. ENT: Comply with NEMA TC 13 and UL 1653.
- D. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- E. LFNC: Comply with UL 1660.
- F. Rigid HDPE: Comply with UL 651A.
- G. Continuous HDPE: Comply with UL 651B.
- H. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

- I. RTRC: Comply with UL 1684A and NEMA TC 14.
- J. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- K. Fittings for LFNC: Comply with UL 514B.
- L. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- M. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman.
 - 3. Mono-Systems, Inc.
 - 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman.
 - 7. Hubbell Incorporated.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. Mono-Systems, Inc.
 - 11. O-Z/Gedney.
 - 12. RACO; Hubbell.
 - 13. Robroy Industries.

14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- 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, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep<Insert dimension>.
- N. Gangable boxes are allowed.
- O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

P. 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.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. NewBasis.
 - d. Oldcastle Precast, Inc.
 - e. Quazite: Hubbell Power System, Inc.
 - f. Synertech Moulded Products.
2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."
7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.6 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC IMC EMT.
 3. Underground Conduit: RNC, Type EPC-40-PVC Type EPC-80-PVC, concrete encased.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. 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. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

- G. Install surface raceways only where indicated on Drawings.
- H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- 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. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 5. Change from ENT to GRC before rising above floor.
- J. Stub-ups to Above Recessed Ceilings:
 1. Use EMT, IMC, or RMC for raceways.
 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. 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. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
1. Install surface raceway with a minimum 2-inch radius control at bend points.
 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, 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 or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. 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. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6 inches in nominal diameter.
 2. Install backfill as specified in Section 31 20 00 "Earth Moving."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line, 24" below grade.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- 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:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel.
 - 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Presealed Systems.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, 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.

- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch-wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
- G. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- H. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.

- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil-thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.4 FLOOR MARKING TAPE

- A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

2.6 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. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. 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."

2.7 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. 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 UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- B. 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 UV-resistant seal for label.
- C. 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.
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.9 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.

2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.10 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 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. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- G. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.
- J. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
- K. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch-wide black stripes on 10-inch centers over orange background that extends full length of raceway or duct and is 12 inches wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch-high black letters on 20-inch centers. Stop stripes at legends. Apply to the following finished surfaces:
1. Floor surface directly above conduits running beneath and within 12 inches of a floor that is in contact with earth or is framed above unexcavated space.
 2. Wall surfaces directly external to raceways concealed within wall.
 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 10-foot maximum intervals.
- C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Emergency Power.
 2. Power.
 3. UPS.
- E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags.

- G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- H. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.
- I. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.
- J. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- L. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- N. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For 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.
- O. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- P. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer.
- Q. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the 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 two lines of text are required, use labels 2 inches high.
- b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
- b. Enclosures and electrical cabinets.
- c. Access doors and panels for concealed electrical items.
- d. Switchboards.
- e. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- f. Substations.
- g. Emergency system boxes and enclosures.
- h. Motor-control centers.
- i. Enclosed switches.
- j. Enclosed circuit breakers.
- k. Enclosed controllers.
- l. Variable-speed controllers.
- m. Push-button stations.
- n. Power transfer equipment.
- o. Contactors.
- p. Remote-controlled switches, dimmer modules, and control devices.
- q. Power-generating units.
- r. Monitoring and control equipment.
- s. UPS equipment.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.

- B. Related Requirements:

1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

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

1. Intermatic, Inc.
2. NSi Industries LLC; TORK Products.

B. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic time dial.
6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

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

1. Intermatic, Inc.
2. NSi Industries LLC; TORK Products.

B. Description: Solid state, with SPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with NEMA C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3 INDOOR OCCUPANCY SENSORS

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

1. Hubbell Building Automation, Inc. (Current).
2. Lutron Electronics Co., Inc.
3. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: 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. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. 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.
 6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
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 10-foot-high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .
1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch-high ceiling.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.
 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.
 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot-high ceiling in a corridor not wider than 14 feet.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. 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., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Building Automation, Inc (Current).
 2. Lutron Electronics Co., Inc.
 3. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.
- C. Wall-Switch Sensor:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
 2. Sensing Technology: Dual technology - PIR and ultrasonic with no minimum load requirement.
 3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
 4. Voltage: Match the circuit voltage; dual-technology type.
 5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
 8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.5 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Corporation.
 2. Square D.
 3. ABB.
 4. Siemens.
- B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.

1. Monitoring: On-off status.
2. Control: On-off operation.

2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. 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.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 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.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lighting control devices will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from 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.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 - 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Include evidence of NRTL listing for series rating of installed devices.
 - 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 7. Include wiring diagrams for power, signal, and control wiring.
 - 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 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. Keys: Two spares for each type of panelboard cabinet lock.
2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NEMA PB 1.

F. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.
- C. 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 two days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Owner's written permission.
 - 3. Comply with NFPA 70E.

1.11 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and surface-mounted cabinets.
1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 6. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
 7. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: Top and bottom.
- C. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
 5. Split Bus: Vertical buses divided into individual vertical sections.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Main and Neutral Lugs: Compression type.
 3. Ground Lugs and Bus-Configured Terminators: Compression type.
 4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 6. Gutter-Tap Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB, Electrification Business.
 3. Square D; a brand of Schneider Electric.
 4. Siemens Industrial; Siemens.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Branch Overcurrent Protective Devices: Fused switches.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB, Electrification Business.
 3. Square D; a brand of Schneider Electric.

4. Siemens Industrial; Siemens.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- 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.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB, Electrification Business.
 3. Square D; a brand of Schneider Electric.
 4. Siemens Industrial; Siemens.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I squared x t response.
 4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 5. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - f. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 - g. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

- h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
 - 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
 - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.

2.5 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- D. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box. 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. Install filler plates in unused spaces.

- H. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- I. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- J. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.

- b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
- c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges recommended by switchgear manufacturer. All electronic circuit breaker settings shall be provided by switchgear manufacturer.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

- 1. Measure as directed during period of normal system loading.
- 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
- 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
- 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Isolated-ground receptacles.
 - 4. Hospital-grade receptacles.
 - 5. Tamper-resistant receptacles.
 - 6. Weather-resistant receptacles.
 - 7. Snap switches and wall-box dimmers.
 - 8. Wall-switch and exterior occupancy sensors.
 - 9. Communications outlets.
 - 10. Pendant cord-connector devices.
 - 11. Cord and plug sets.
 - 12. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 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 application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 8310 (single), 8300 (duplex).
 - b. Hubbell; HBL8310 (single), HBL8300 (duplex).
 - c. Leviton; 8310 (single), 8300 (duplex).
 - d. Pass & Seymour; 8301 (single), 8300H (duplex).
 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; IG5362RN.
 - b. Hubbell; IG5362.
 - c. Leviton; 5362-IG.
 - d. Pass & Seymour; IG5362.
 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- C. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; TR8300.
 - b. Hubbell; HBL8300SGA.
 - c. Leviton; 8300-SGG.
 - d. Pass & Seymour; TR63H.
 2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.

2.4 GFCI RECEPTACLES

- A. General Description:
1. Straight blade, non-feed-through type.
 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

- C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; VGFH20.
 - b. Hubbell; HFR8300HL.
 - c. Leviton; 7899-HG.
 - d. Pass & Seymour; 2095HG.

2.5 PENDANT CORD-CONNECTOR DEVICES

- A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

- A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

- B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Single Pole:
 - 2) Cooper; AH1221.
 - 3) Hubbell; HBL1221.
 - 4) Leviton; 1221-2.
 - 5) Pass & Seymour; CSB20AC1.
 - 6) Three Way:
 - 7) Cooper; AH1223.
 - 8) Hubbell; HBL1223.
 - 9) Leviton; 1223-2.
 - 10) Pass & Seymour; CSB20AC3.
 - 11) Four Way:
 - 12) Cooper; AH1224.

- 13) Hubbell; HBL1224.
- 14) Leviton; 1224-2.
- 15) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
- 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
- 2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

2.9 WALL PLATES

- A. 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 (non-breakable).
 - 3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic (non-breakable).
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with "in-use" lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.

- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hubbell Incorporated; Wiring Device-Kellems.
 2. Wiremold/Legrand.
- B. Description:
 1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
 2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- C. Raceway Material: Metal, with manufacturer's standard finish.
- D. Multioutlet Harness:
 1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
 2. Receptacle Spacing: 9 inches.
 3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.12 FINISHES

- A. Device Color (Verify all colors with Architect):
 1. Wiring Devices Connected to Normal Power System: Light Almond, or as selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

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. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 2. 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.
 3. 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.
 4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. 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.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 26 05 53 "Identification for Electrical Systems."
- B. Identify each light switch and receptacle with panelboard identification and circuit number. Use engraved machine printing with white-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes. All wiring device (light switch and receptacle) cover plates shall be machine engraved. Hand engraving will not be acceptable.

3.4 FIELD QUALITY CONTROL

- A. Tests for Convenience 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.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- B. Test straight-blade convenience outlets in patient-care areas and hospital-grade convenience outlets for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz..
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Include evidence of NRTL listing for series rating of installed devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 6. 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.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.

- B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, 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. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 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. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

- D. 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.
- E. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.
- B. 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.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB, Electrification Business.
 3. Square D; a brand of Schneider Electric.
 4. Siemens Industrial; Siemens.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Compression type, suitable for number, size, and conductor material.
7. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB Electrification Business.
 3. Square D; a brand of Schneider Electric.
 4. Siemens Industrial; Siemens.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 4. Hookstick Handle: Allows use of a hookstick to operate the handle.
 5. Lugs: Compression type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. ABB Electrification Business.
 3. Square D; a brand of Schneider Electric.
 4. Siemens Industrial; Siemens.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Instantaneous trip.
 2. Long- and short-time pickup levels.

3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I^2t response.
- F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- H. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- I. Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 8. Zone-Selective Interlocking: Integral with ground-fault trip unit; for interlocking ground-fault protection function.
 9. Electrical Operator: Provide remote control for on, off, and reset operations.

2.4 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "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. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- D. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.

- c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
 - E. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
 - F. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- 3.5 ADJUSTING
- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
 - B. Set field-adjustable circuit-breaker trip ranges as recommended by circuit breaker manufacturer. All electronic circuit breaker settings are to be provided by circuit breaker manufacturer.

END OF SECTION 262816

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following types of LED luminaires:
 - 1. Downlight.
 - 2. Linear industrial.
 - 3. Recessed linear.
 - 4. Strip light.
 - 5. Surface mount, linear.
 - 6. Surface mount, nonlinear.
 - 7. Suspended, linear.
 - 8. Suspended, nonlinear.
 - 9. Materials.
 - 10. Finishes.
 - 11. Luminaire support.
- B. Related Requirements:
 - 1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests IES LM-79 and IES LM-80.
 - a. 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.
 - b. 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.

D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

1. Include Samples of luminaires and accessories involving color and finish selection.

E. Samples for Verification: For each type of luminaire.

1. Include Samples of luminaires and accessories to verify finish selection.

F. Product Schedule: For luminaires and lamps.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extend to within 12 inches of the plane of the luminaires.
4. Structural members to which equipment and or luminaires will be attached.
5. Initial access modules for acoustical tile, including size and locations.
6. Items penetrating finished ceiling, including the following:
 - a. Other luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Ceiling-mounted projectors.

- 7. Moldings.
 - B. Qualification Data: For testing laboratory providing photometric data for luminaires.
 - C. Seismic Qualification Certificates: For luminaires, 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.
 - D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - E. Product Certificates: For each type of luminaire.
 - F. Product Test Reports: For each luminaire, for tests performed by a qualified testing agency.
 - G. Sample warranty.
- 1.6 CLOSEOUT SUBMITTALS
- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 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. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.
- E. Mockups: For interior luminaires in room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of luminaires in mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 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 LUMINAIRE REQUIREMENTS

- A. Refer to Lighting Fixture Schedule on drawings for specific lighting fixture types and model numbers.
- 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. Standards:
 - 1. ENERGY STAR certified.
 - 2. California Title 24 compliant.
 - 3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
 - 4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
 - 5. UL Listing: Listed for damp location.
 - 6. Recessed luminaires shall comply with NEMA LE 4.
 - 7. User Replaceable Lamps:
 - a. Bulb shape complying with ANSI C78.79.
 - b. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- D. CRI of minimum 80. CCT of 3500 K or 4100 K as scheduled.
- E. Rated lamp life of 50,000 hours to L70.
- F. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- G. Internal LED driver.
- H. Nominal Operating Voltage: 120 V ac.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- I. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Powder-coat painted finish.

2.2 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Prismatic acrylic
2. 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.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Powder-coat painted finish.

E. 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. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.3 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.

2.4 LUMINAIRE SUPPORT

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 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 vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- G. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two 5/32-inch-diameter aircraft cable supports adjustable to 120 inches in length.
- H. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.

2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 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.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire alarm wire and cable.
 - 2. Identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

1.7 FIELD 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 UTP cable 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 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; 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.
- 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.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 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.
- B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- C. Signaling Line Circuits: Twisted, shielded pair, 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.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer

jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.4 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Worldwide, Inc.
 - 2. HellermannTyton North America.
 - 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 Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Cable will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
 - 1. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
 - 2. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring within Enclosures:
 - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 - 2. Install lacing bars and distribution spools.
 - 3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.

4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

3.4 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal raceway according to Section 260533 "Raceways 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 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.

- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
 1. Class 1 remote-control and signal circuits, No. 14 AWG.
 2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
 3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

- A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."

3.8 GROUNDING

- A. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
- B. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes fire alarm systems.
- B. Related Sections include the following:
 - 1. Division 08 Section "Door Hardware" for door closers and holders with associated smoke detectors, electric door locks, and release devices that interface with the fire alarm system.

1.3 DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the micro-processor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
- D. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- E. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- F. The installing company shall employ NICET (minimum Level III Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.4 SCOPE:

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
 - 2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
 - 3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
 - 4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

6. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.
7. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the system display shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.5 SUBMITTALS

A. General:

1. Ten copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

E. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.6 GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of

maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.7 POST CONTRACT MAINTENANCE:

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
 - 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
 - 2. Each circuit in the fire alarm system shall be tested semiannually.
 - 3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.8 POST CONTRACT EXPANSIONS:

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.9 APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

- A. National Fire Protection Association (NFPA) - USA:
 - No. 12 CO2 Extinguishing Systems (low and high)
 - No. 12B Halon 1211 Extinguishing Systems
 - No. 13 Sprinkler Systems
 - No. 13A Halon 1301 Extinguishing Systems
 - No. 15 Water Spray Systems
 - No. 16 Foam/Water Deluge and Spray Systems
 - No. 17 Dry Chemical Extinguishing Systems
 - No. 17A Wet Chemical Extinguishing Systems
 - Clean Agent Extinguishing Systems
 - No. 72 National Fire Alarm Code
 - No. 101 Life Safety Code
- B. Underwriters Laboratories Inc. (UL) - USA:
 - No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - No. 864 Control Units for Fire Protective Signaling Systems
 - No. 268A Smoke Detectors for Duct Applications
 - No. 521 Heat Detectors for Fire Protective Signaling Systems
 - No. 464 Audible Signaling Appliances

- No. 38 Manually Actuated Signaling Boxes
- No. 346 Waterflow Indicators for Fire Protective Signaling Systems
- No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
- No. 1971 Visual Notification Appliances
- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).

1.10 APPROVALS:

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
UL Underwriters Laboratories Inc
ULC Underwriters Laboratories Canada
- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

PART 2.0 PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE:

- A. Conduit:
 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
 2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-55.
 4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
 6. Conduit shall be 3/4-inch minimum.
- B. Wire:
 1. All fire alarm system wiring shall be new.
 2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG for Notification Appliance Circuits.
 3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation

- as indicated in NFPA 70 (e.g., FPLR).
5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
 6. All field wiring shall be electrically supervised for open circuit and ground fault.
 7. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems that do not allow or have restrictions in, for example, the amount of t-taps, length of t-taps etc., are not acceptable.
- C. Terminal Boxes, Junction Boxes and Cabinets:
All boxes and cabinets shall be UL listed for their use and purpose.
- D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
- E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.
- 2.3 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:
- A. Main FACP or network node shall be a Notifier Fire-Warden 50X (NFW-50X) or equal with cellular GSM communicator (Cell-Cab-N) and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.
- B. Operator Control
1. Acknowledge Switch:
 - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.
 - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
 2. Alarm Silence Switch:
Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
 3. Alarm Activate (Drill) Switch:
The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
 4. System Reset Switch:
Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
 5. Lamp Test:
The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.
- C. System Capacity and General Operation
1. The control panel or each network node shall provide, or be capable of 318 intelligent/addressable devices.
 2. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC.
 3. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
 4. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, Gentex and Wheelock Notification Appliances.
 5. The system shall include a full featured operator interface control and annunciation panel that shall

- include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
6. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
 7. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.
 8. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.
 9. The FACP or each network node shall provide the following features:
 - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
 - c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.
 - e. The ability to display or print system reports.
 - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
 - g. PAS presignal, meeting NFPA 72 3-8.3 requirements.
 - h. Rapid manual station reporting (under 3 seconds) and shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.
 - i. Periodic detector test, conducted automatically by the software.
 - j. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
 - k. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
 - l. Walk test, with a check for two detectors set to same address.
 - m. Control-by-time for non-fire operations, with holiday schedules.
 - n. Day/night automatic adjustment of detector sensitivity.
 - o. Device blink control for sleeping areas.
 10. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3 minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."
 11. Network Communication
 - a. The FACP shall be capable of communicating on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol.
- D. Central Microprocessor
1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
 3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
 4. A special program check function shall be provided to detect common operator errors.
 5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
 6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
- E. System Display
1. The system shall support an 80 character display. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.
 2. The display shall provide all the controls and indicators used by the system operator:
 - a. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
 3. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
 4. The display shall also provide Light-Emitting Diodes.
 - a. The 80-character display shall provide 12 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, ALARM SILENCED, Controls Active, Pre-Discharge, Discharge and Abort.
 5. The display shall provide a QWERTY type keypad
 - a. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
 6. The system shall support the display of battery charging current and voltage on the 80-character LCD display.
- F. Signaling Line Circuits (SLC)
1. Each FACP or FACP network node shall support one SLC. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of 318 devices. SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
 2. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
- G. Serial Interfaces
1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed ITE peripherals (printer, monitor, etc.).
 - a. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.
 - b. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

H. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

I. Power Supply:

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 55 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
Ground Fault LED
AC Power Fail LED
NAC on LED (4)
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 200 AH.
7. All circuits shall be power-limited, per UL864 requirements.

J. Auxiliary Field Power Supply - Addressable

1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.
2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0 amp hour batteries.
3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
4. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
6. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.
7. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
8. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.

9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.
 10. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.
 11. Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
 12. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
 13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.
 14. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
 15. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
 16. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.
- K. Field Charging Power Supply (FCPS)
The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.
 2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
 3. The FCPS shall include an attractive surface mount backbox.
 4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
 5. The FCPS include power limited circuitry, per 1995 UL standards.
- L. Specific System Operations
1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
 2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
 3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
 4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
 - a. Device status
 - b. Device type
 - c. Custom device label
 - d. View analog detector values
 - e. Device zone assignments
 - f. All program parameters
 5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
 6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activa-

tions will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
9. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.
10. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
 - a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
 - b. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
 - c. All devices tested in walk test shall be recorded in the history buffer.
11. Waterflow Operation
An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
12. Supervisory Operation
An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
13. Signal Silence Operation
The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.
14. Non-Alarm Input Operation
Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
15. Combo Zone
A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.4 SYSTEM COMPONENTS:

- A. Programmable Electronic Sounders:
 1. Electronic sounders shall operate on 24 VDC nominal.
 2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.
 3. Shall be flush or surface mounted as shown on plans.
- B. Speakers:
 1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.
 2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
 3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
 4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

- C. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:
1. The maximum pulse duration shall be 2/10 of one second.
 2. Strobe intensity shall meet the requirements of UL 1971.
 3. The flash rate shall meet the requirements of UL 1971.
- D. Manual Fire Alarm Stations
1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.
 2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
 3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet front or side.
 4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch in size or larger.
- E. Conventional Photoelectric Area Smoke Detectors
1. Photoelectric smoke detectors shall be a 24 VDC, two wire, ceiling-mounted, light scattering type using an LED light source.
 2. Each detector shall contain a remote LED output and a built-in test switch.
 3. Detector shall be provided on a twist-lock base.
 4. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
 5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash at least every 10 seconds, indicating that power is applied to the detector.
 6. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.
 7. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
 8. All field wire connections shall be made to the base through the use of a clamping plate and screw.
- F. Duct Smoke Detectors
- Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, with remote test and reset switches. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.
- G. Waterflow Indicator:
1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
 2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
 3. All waterflow switches shall come from a single manufacturer and series.
 4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
 5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.
- H. Sprinkler and Standpipe Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
 2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
 3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
 4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
 5. The switch housing shall be finished in red baked enamel.
 6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
 7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

- a. This unit shall provide for each zone: alarm indications, using a red alarm and a yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
 - b. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.
- I. Alphanumeric LCD Type Annunciator:
- 1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
 - 2. The LCD annunciator shall display all alarm and trouble conditions in the system.
 - 3. An audible indication of alarm shall be integral to the alphanumeric display.
 - 4. The display shall be UL listed for fire alarm application.
 - 5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
 - 6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
 - 7. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset, which shall be protected from unauthorized use by a keyswitch or password.
 - 8. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.
- J. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.
- K. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.
- 1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
 - 2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
 - 3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
 - 4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
 - 5. Communication shall include vital system status such as:
 - Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - Independent Addressable Device Status
 - AC (Mains) Power Loss
 - Low Battery and Earth Fault
 - System Off Normal
 - 12 and 24 Hour Test Signal
 - Abnormal Test Signal (per UL requirements)
 - EIA-485 Communications Failure
 - Phone Line Failure
 - 6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
- L. Field Wiring Terminal Blocks
For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

2.5. SYSTEM COMPONENTS - ADDRESSABLE DEVICES

- A. Addressable Devices - General
1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
 2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.
 3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
 4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
 5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
 6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.
 8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
 9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
 10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
 11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
 12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
 13. Addressable modules shall mount in a 4-inch square, 2-1/8 inch deep electrical box. An optional surface mount Lexan enclosure shall be available.
- B. Addressable Manual Fire Alarm Box (manual station)
1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
- C. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
- E. Intelligent Duct Smoke Detector
1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification

- from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
- F. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
 2. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
 3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
- G. Two Wire Detector Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
 2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- H. Addressable Control Module
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.
 2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.
 3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
 4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
- I. Addressable Relay Module
1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
- J. Isolator Module
1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
 2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- 2.6 BATTERIES:
- A. The battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
 - B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
 - C. If necessary to meet standby requirements, external battery and charger systems may be used.

PART 3.0 – EXECUTION

3.1 INSTALLATION:

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

3.2 TESTING:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
- L. When the system is equipped with a Voice Evacuation Control panel, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying voice messages.

3.3 FINAL INSPECTION:

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

- A. Instruction to the Owner shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. A minimum of eight (8) hours of training shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION 283111